



Via e-mail: [Lyle.Leiser@fmglobal.com](mailto:Lyle.Leiser@fmglobal.com)

February 10, 2014

Affiliated FM Insurance Company  
Mr. Lyle Leiser  
Senior Adjuster  
601 – 108<sup>th</sup> Avenue NE  
Suite 1400  
Bellevue, Washington 98004  
425.709.5065

RE: LYNNWOOD RECREATION CENTER NATATORIUM

Location of Loss	: 18900 44 <sup>th</sup> Avenue West, Lynnwood, Washington
Date of Loss	: January 1, 2011 (Reported)
Affiliated FM Insurance Company Claim ID	: 425958
Thornton Tomasetti No.	: G13106.00

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Dear Mr. Leiser:

At the request of Affiliated FM Insurance Company, Thornton Tomasetti (TT) performed a technical inspection and assessment of the above-referenced loss site. TT conducted the site inspection on August 30, 2013 and completed its preliminary analysis in accordance with its assignment letter from your office dated August 29, 2013. Specifically, TT's assignment included the following areas of inquiry:

1. Complete a site visit and gather onsite reconnaissance information.
2. Provide a document request and perform an independent review of reports, drawings, and other materials gathered through this request.
3. Provide a written report summarizing our findings and opinions.

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The date of loss is reported to be January 1, 2011. The insured is the City of Lynnwood. Bruce K. Arita, AIA of Thornton Tomasetti performed the site examination, completed the analysis of observations and documents, and prepared this report of findings.

Mr. Arita inspected the premises on August 30, 2013 with Lyle Leiser of Affiliated FM Insurance Company. The inspection was facilitated by the Lynnwood Aquatic Supervisor, William Haugen.

TT's report of findings is as follows:

## DESCRIPTION OF BUILDING AND AREA OF INVESTIGATION

The building is a single story recreation center containing offices, meeting rooms, and a grouping of indoor swimming pools and related aquatic features (the "natatorium"). The natatorium houses two main pools (northerly and southerly) separated by a glazed wall, with each area including aquatic recreational equipment such as spas, slides, and fountains (Photo 1).

The westerly portion of the natatorium housing both pools and associated facilities exhibit the conditions of concern (see Exhibit 1). The construction of the building consists of timber and steel roof framing with concrete piers and glazed walls.

The northerly pool is an active swimming feature with spray fountains and slide activities. The southerly pool consists of a still swimming pool for lap swimming. Both sides of both pools are visually controlled by a common-space Aquatics Office.

## BACKGROUND

During the site visit on August 30, 2013 Mr. Arita conducted a brief interview with William Haugen to discuss the conditions experienced that led up to the investigations conducted by the other experts. The list below summarizes the key points of the interview:

- Mr Haugen confirmed that the natatorium was completed only a few years ago.

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- He stated that corrosion in the new natatorium appeared shortly after the building was opened. In his opinion, the building is exhibiting corrosion comparable to a building that is 15 to 20 years old.
- He stated that the air quality did not smell right when the building was opened, and that there was a strong chlorine smell in the natatorium.
- He stated that the appearance and progression of the corrosion was more pronounced on the north side of the natatorium than on the south side.
- He stated that the air handlers were run at higher than normal volume ("full bore all the time") with little to no apparent effect on the rate of corrosion.
- He confirmed that the city was undertaking remedial repairs and that these repairs are ongoing.

## DOCUMENT REVIEW

Available documents were provided to TT for review and analysis. The documents include the following:

- "Building Envelope Investigation" by BCRA. June 12, 2012.
- "Field Report" by BCRA. August 17, 2013.
- "Existing Roof Condition" by Queen City Sheet Metal & Roofing, Inc. August 26, 2013.

TT's analysis of the documents is as follows:

1. BCRA Investigation Report, June 12, 2012:

This report investigated claimed and potential areas of degraded building materials and trapped moisture in the building. The mechanical system was reportedly performing poorly, and interactions between the natatorium and the rest of the building may have

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been contributing factors to the building degradation. The report identifies the portions of the structure that were investigated and is accompanied by photographs of the test locations and the test results.

The mechanical system as originally installed with the new pool installation was reportedly operating at positive pressure. Instead of extracting the moisture-laden air out of the pool rooms, it was allowing the moisture-laden air to remain in the room and the positive net pressure was also reportedly coercing air into the walls and building cavities. The photographs support this assertion as evidenced by widespread corrosion on interior elements such as fasteners and door hardware, and corrosion inside the wall cavities.

The mechanical system has reportedly been amended to correct the air-flow so that it is now operating at negative pressure, but the system may still not be performing as desired as condensation was observed on interior elements such as the translucent roof panels and the roof framing.

The report identifies the following areas of concern regarding the building's design and construction:

- Chemical-induced corrosion is still evident in the building. Fixtures are exhibiting a higher than expected level of corrosion. Equipment that used to be maintained periodically is now requiring almost daily maintenance.
- Building design and construction deficiencies. Even though the vapor barrier in the wall is in the proper position, vapor-laden air is gaining access to the wall cavities. The walls as designed and constructed do not address thermal bridging of the framing which increases the potential for condensation in the walls.
- Ponding of low-sloped roofs. A 1/8" slope was called out on the plans, but the manufacturer recommends a 1/4" minimum slope.

## 2. BCRA Field Report, August 17, 2013:

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This report investigated claims of mold found inside the roofing assembly. Destructive investigation of the roofing assembly found that there was no vapor barrier installed over the concrete roof deck as shown in the original construction documents. Additional investigations were recommended to determine the extent of mold, moisture, and vapor barrier conditions.

3. Letter by Queen City Sheet Metal & Roofing, Inc. August 26, 2013:

This letter identifies additional locations of upper and lower roof investigations where the lack of a vapor barrier was observed, the presence of moisture and mold growth, as well as deterioration of existing roofing materials.

TT also requested the following additional documents:

Document	Description	Received
Agreements	Warranty documentation related to building components other than "Red Shield Warranty – Firestone Roof dated 12/17/2010 (already provided to TT).	No
Drawings	Original building construction drawings	Yes
Drawings	Original building specifications and project manual	No
Drawings	Repair or renovation drawings and specifications, if available	Yes
Drawings	Addendum or construction phase sketches, drawings, & narratives	Yes
Photographs	Photos of conditions pertinent to the investigation, if available	No
Photographs	Videos of conditions pertinent to the investigation, if available	No
Reports	Expert technical reports, if available other than "Building Envelope Investigation," June 12, 2012 (already provided to TT)	No
Schedules	Project repair-related schedules	No

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TT's analysis of the documents is as follows:

1. Original building construction drawings: "Additions and Modernization of the Lynnwood Recreation Center" by NAC Architecture. December 11, 2009. Construction drawings for the addition of a new pool room and remodeling of the existing pool room.
2. Repair or renovation drawings: "Lynnwood Recreation Center" by ORB Architects. June 21, 2013. Construction drawings for new mechanical equipment at the natatorium.
3. Construction phase correspondence: "Requests for Information" by Holmberg Company, various dates. Correspondence between contractor and owner regarding requests for additional information regarding the construction documents.

## OBSERVATIONS

A site visit was performed by Thornton Tomasetti on August 30, 2013. Representative photographs of observed conditions are included in Appendix A. No destructive investigations were performed. Observations were limited to visual observations of readily accessible areas. The following was observed by TT during our site visit:

- Corroded door hardware in pool rooms (Photos 2 and 3) and adjacent office (Photo 4)
- Corroded fasteners at connections in pool room (Photo 5) and stairway (Photo 6)
- Fasteners at interior pool equipment connections (Photo 7) exhibited a much higher level of corrosion than similar connections at exterior pool equipment connections (Photo 8)
- Deteriorated roofing materials (Photos 9 and 10)

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## DISCUSSION

Control of the air and water temperature, chemical concentrations, humidity levels, and air flow in a natatorium are important to provide maximum occupant comfort with minimum impact on the building and equipment. Of these, chlorine management and air flow are the most important. If these are not properly controlled, the interior air quality will diminish and the building will be subject to accelerated physical deterioration.

### Chemical Management:

Chlorine is a common chemical for disinfection of swimming pools, but it can present problems if the byproducts are not properly controlled. Compounds which contain nitrogen are introduced into the pool water by the bathers (such as sweat, body oils, and other proteins containing nitrogen) and can combine with the chlorine to form chloramines.

As the chloramine levels in the water increase, some of the chloramines off-gas into the air. In outdoor pools, this is not a problem as it is quickly dispersed in the outside air. In a natatorium, the airborne chloramines can accumulate, and the unpleasant odor is noticeable. The chlorine smell that is commonly associated with indoor swimming pools is due to this off-gassing of chloramines. This condition was noted in the natatorium by the building staff shortly after the facility was opened.

These airborne chloramines can readily combine with moisture in the air. Consequently, condensation of chloramine-laden moisture will develop corrosive properties. The airborne moisture in the natatorium comes from the evaporation of the pool water. In active pools such as the north natatorium, fountains and high occupant activity can increase the evaporation rate of the pool water, and thus increase the relative humidity. The accelerated rate of documented corrosion in the north pool natatorium relative to the south pool side is caused by elevated humidity levels on that side.

Maintaining a low chloramine content poses challenges due to the varying levels of occupant activity. While elevating the chlorine levels in the water will reduce the chloramine levels, it can act to diminish occupant comfort (chlorine reaction with the bather's skin). The alternative to managing chloramines in the water is to manage the off-gassed chloramines in the air.

### Air Flow:

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Managing the chloramines in the air requires the management of air flow throughout the pool space. Most of the chloramines will be removed from the space by drawing them away from the swimming areas and expel them from the natatorium before they have a chance to combine with free water in the air. The chloramines that do combine with moisture in the air, but have not been exhausted from the room, need to be kept away from interior surfaces and concealed spaces so that condensation does not form and corrode building components.

Introducing volumes of outdoor fresh air and exhausting moisture laden air is a common approach to minimizing chloramine-laden air in natatoriums. With this approach, it is important that the mechanical equipment be configured to draw air out at a faster rate than it is being introduced to the room. This condition is what is known as “negative pressure” since the pressure inside the room is less than the pressure outside the room. If the pressure inside the room is higher than the pressure outside, then some of the contaminated air tries to exhaust through openings in the vapor barrier in the walls where it becomes trapped and condenses. Testing on the mechanical systems by BCRA indicated that the “positive pressure” conditions that existed when the new construction was completed has recently been corrected, but building staff reported that the equipment had to be run at a much higher rate and for a longer period of time than expected.

Condensation can also be controlled by keeping the surface temperature above the dew point temperature or providing a barrier between the warm, moist air and the cool surfaces. At exterior windows and doors, warm air from the HVAC system should be directed onto these surfaces to keep them above the dew point temperature. At exterior walls, a vapor retarder should be provided at the interior side of the wall assembly to keep the warm, moist air away from the cool exterior face of the wall.

#### Building vulnerability:

These methods will not remove all of the free chloramines in the air, so any surfaces that may come into contact with corrosive condensation should be made of corrosion-resistant materials such as tile, stainless steel, galvanized steel, fabric, or other material that is resistant to chloramine reactivity. In the presence of aqueous solutions containing electrolytes (such as chloride ions found in pool water), the iron in steel reacts with these materials and corrodes (rusts). Even stainless steel contains some iron which is also susceptible to attack from chloride ions. Stainless steel typically requires much less maintenance than other types of steels, but it is not maintenance-free.

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Corrosion does not occur instantaneously, nor does it occur as a result of a single occurrence of water coming into contact with the steel. In a high humidity environment such as a pool natatorium, some level of corrosion is anticipated. While the quantity of deterioration observed does not yet raise concerns of occupant safety, the levels observed are higher than would be expected for a building that has been in operation for only a few years. In order for the corrosion to progress to the extent that it produces the quantity of deterioration which was observed, the structure had to have been subject to higher than expected levels of moisture containing corrosive compounds since the natatorium remodel was finished.

Destructive investigation and testing conducted by BCRA identified occurrences of elevated levels of moisture in the building both in the occupied spaces and inside the wall cavities. Humidity levels observed during the testing indicate that levels are within the favorable range of 40% to 60%, but in the presence of chlorine compounds (chloramines) given off by the pool water, condensation can become corrosive. The report indicates that condensation is still occurring at the skylights and interior surfaces in the building even though the mechanical systems have been reconfigured, and the design and construction of the walls can still contribute to condensation formation.

Destructive investigation by BCRA conducted on the roof as well as observations by Queen City Sheet Metal and Roofing, Inc. also suggests that there are design and/or construction deficiencies which are contributing to the deterioration of the roofing materials. Microbial growth does not occur instantaneously, which suggests that the roofing deterioration has been occurring for some time. Observations by Queen City Sheet Metal and Roofing, Inc. indicate that the omission of the vapor barrier occurs throughout both the high and low roofs.

## CONCLUSION

The source of the moisture in the wall spaces is evaporated water from the pool. The mechanical system is responsible for removing humid air and maintaining proper air flow to prevent condensation in the pool room, and the wall construction should be such that moist air does not enter the wall spaces where it can condense and contribute to wall deterioration. Investigations conducted by BCRA indicate that the mechanical system and building design and/or construction conditions are responsible for corrosive condensation coming into contact

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with door hardware, fasteners, and other interior surfaces, and causing the deterioration that was observed.

The source of the moisture in the roof is also evaporated water from the pool. Investigations conducted to date indicate that the vapor barrier specified in the construction drawings was not installed. Without the vapor barrier, the moisture can accumulate in the roof assembly and condense which has caused the deterioration of the roofing materials and the mold growth.

While it is difficult to pinpoint a specific duration, in TT's opinion the deterioration is estimated to have been ongoing for a number of years starting from the completion of the new pool facilities, and that problems with the design and/or construction of the building is responsible for the ongoing deterioration as suggested by the other experts.

## LIMITATIONS

Thornton Tomasetti's professional services have been performed in accordance with the standards of skill and care generally exercised by other professional consultants acting under similar circumstances and conditions at the time the services were performed.

Thornton Tomasetti's findings, conclusions and opinions are based on Thornton Tomasetti's visual observations, professional experience, interviews with those knowledgeable with the conditions pertinent to the subject investigation, evaluation of documentation and sound investigation practices.

While Thornton Tomasetti's findings are summarized as of the date of issuance, should new information or additional documentation become available, Thornton Tomasetti may amend or revise its opinions and recommendations accordingly.

This report shall not be construed to warrant or guarantee the building and/or any of its components under any circumstances. Thornton Tomasetti shall not be responsible for latent or hidden defects that may exist, nor shall it be inferred that all defects have been either observed or recorded. TT's visual observations include no specific knowledge of concealed construction or subsurface conditions at the subject property. Comments pertaining to concealed construction or subsurface conditions are professional opinion of TT based on relevant experience, judgment and current standards of practice.

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The review is intended solely to investigate the cause and origin and/or scope of damage at the subject loss on behalf of Affiliated FM Insurance Company. Conditions noted in this report are as of the time of observation only. It can be expected that the subject building will undergo changes and additional deterioration subsequent to that date.

No other warranty, expressed or implied, is made as to the professional advice presented in this report.

Very truly yours,

**THORNTON TOMASETTI, INC.**



Bruce Arita, AIA  
Senior Vice President

Enclosure: Exhibit A: Recreation Center Floor Plan  
Appendix A: Photo Report  
Appendix B: "Building Envelope Investigation," BCRA, June 12, 2012  
Appendix C: "Field Report," BCRA, August 17, 2013  
Appendix D: "Existing Roof Condition," Queen City Sheet Metal & Roofing, Inc.  
Appendix E: Documents downloaded from Lynnwood FTP site, October 22, 2013



**APPENDIX A: PHOTO REPORT**



Photo 1: Aerial view of Recreation Center, looking west



Photo 2: Corrosion at door handle



Photo 3: Corrosion at door



Photo 4: Corrosion at cabinet handles



Photo 5: Corrosion at pool equipment anchorage



Photo 6: Corrosion at stair railing



Photo 7: Corrosion at column fasteners inside the natatorium



Photo 8: Column fasteners outside of the natatorium



Photo 9: Deterioration at roofing assembly

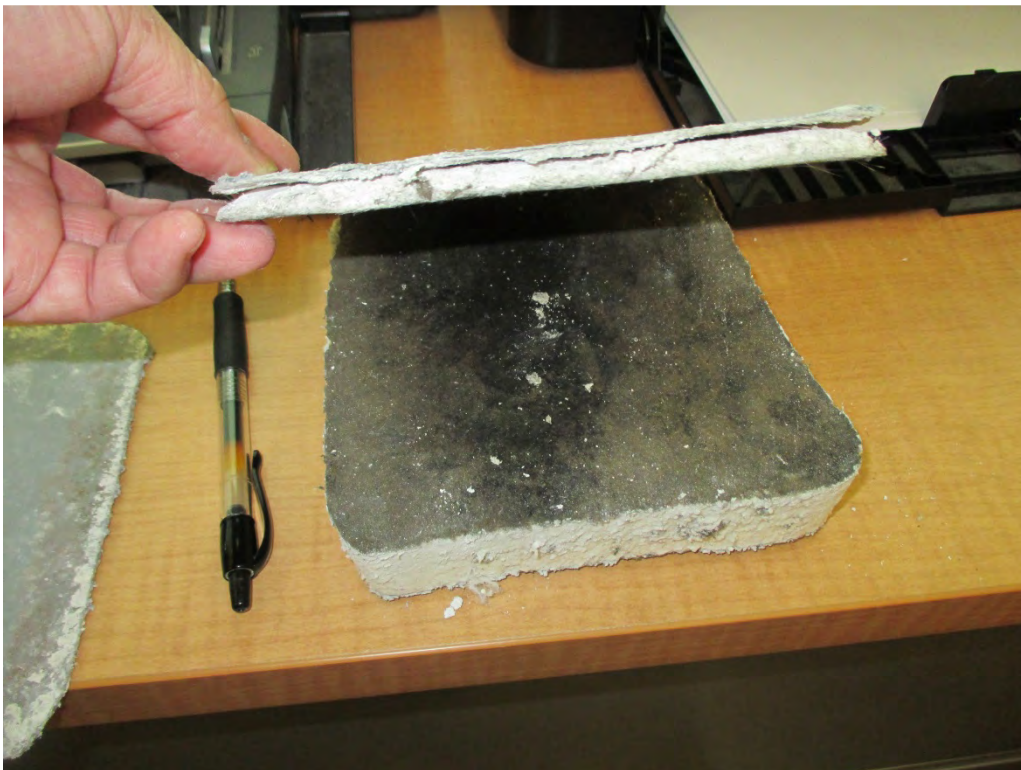


Photo 10: Deterioration at roofing assembly

**APPENDIX B: “Building Envelope Investigation,” BCRA, June 12, 2012**

# **Building Envelope Investigation**

## **Lynnwood Recreation Center**

### **Lynnwood, Washington**

**Project No: 12110**

**Property: 18900 44<sup>th</sup> Ave West**  
**Lynnwood, WA 98036**

**For: City of Lynnwood**

**Date: June 12, 2012**



## OVERVIEW

Purpose Of Investigation – Visual, infrared, and climatic conditions assessment of recreation center, specifically regarding the interaction of natatorium spaces with the rest of the building and mechanical systems.

Scope - The issues noted in this report address actual and potential areas of degraded building materials and trapped moisture in the building. Recommendations are offered to assist the City of Lynwood in maintenance and repair of the building due to poorly performing mechanical systems and interactions between the natatorium spaces and the rest of the building.

Investigation Limitations - The methods used in the investigation site visit included visual inspection, infrared thermography, photographic documentation, and climatic data collection. Limited intrusive openings were made into the building from the exterior or interior. Any comments or recommendations are based on areas observed and discussions with the client or building occupants.

## FINDINGS

### Climatic Data Collection

BCRA used HOBO data loggers to record temperature, relative humidity, and light intensity data over a period of one week and placed the units in strategic locations in and around the natatorium spaces. Data points were collected every four minutes (approximately) and the resulting graphs were interpreted to draw conclusions about the performance of mechanical systems and the effects of occupant load and program schedule on the climate in and around the natatoriums.

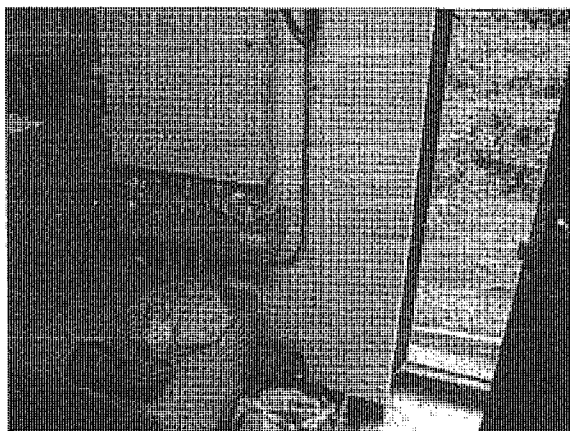


Figure 1. Data logger placed in boiler room with thermocouple to exterior

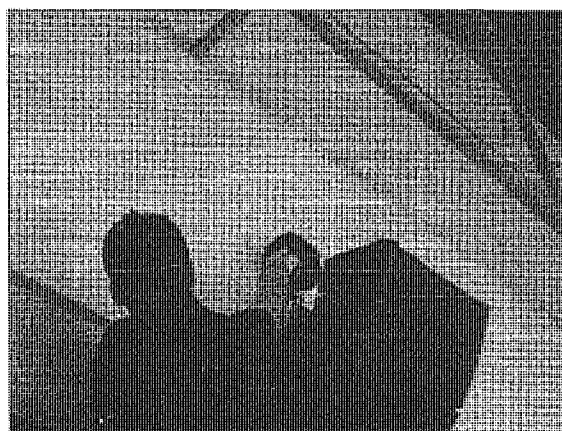


Figure 2. Data logger placed above speaker in "beach" natatorium

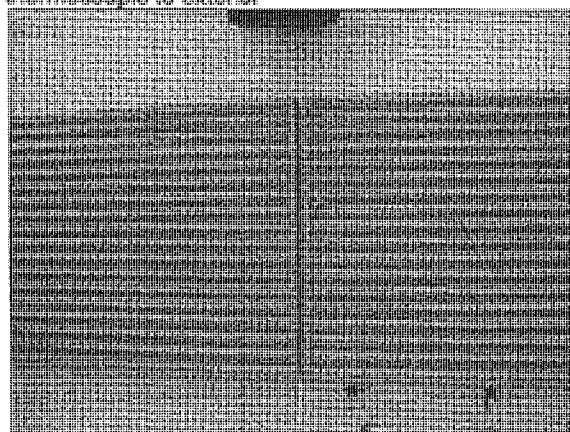


Figure 3. Data logger attached to sound damper screen in "lap" natatorium

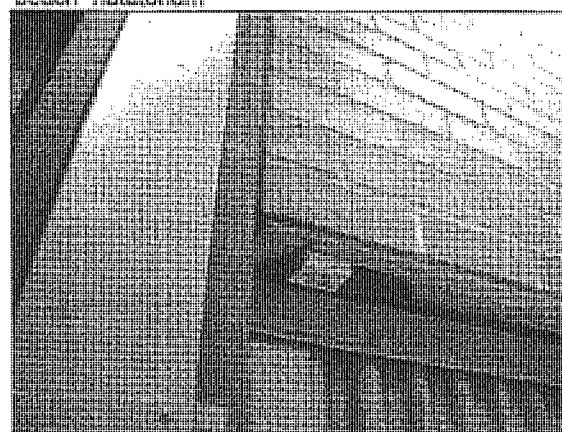


Figure 4. Data logger placed on the exterior of the building at the roof level

Results of the data collection are shown graphically as Appendix A to this report. See Table 1 below for basic statistics for the temperature and relative humidity data for each of the four locations. The data indicates that changes and additions to the HVAC system serving the natatoriums appear to have had a positive effect and have stabilized the temperature balance between the two natatorium spaces, as well as reducing the overall relative humidity to more acceptable levels. Additionally, BCRA was able to

observe that the Natatoriums are operating at a negative pressure relative to the exterior and surrounding interior spaces and are thus not pushing hot, humid air laden with chlorine and chloramines into the surrounding construction.

Table 1. Statistical Analysis of Lynnwood Recreation Center Climatic Data

	Beach Temp (*F)	Beach RH (%)	Lap Temp (*F)	Lap RH (%)	Boiler Temp (*F)	Boiler RH (%)	Ext Temp (*F)	Ext RH (%)
Minimum	78.7	31.0	81.5	29.7	69.7	26.3	48.3	24.8
Maximum	91.0	81.9	90.2	54.2	82.2	62.1	72.5	80.3
Mean	86.0	48.4	85.3	40.0	78.4	38.9	57.3	59.6

### Visual and Infrared Inspection

A visual and infrared inspection of the building was performed both on the exterior and interior. The inspection centered on the natatorium areas but also included surrounding interior spaces and the roof. The findings of the inspection are documented in the following images.



Figure 5. Moisture collecting under tube slide



Figure 6. Condensation on exterior door frame

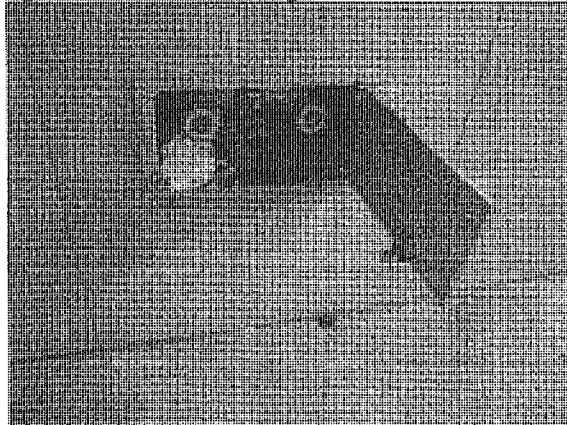


Figure 7. Corrosion on valves and housing/hardware



Figure 8. Corrosion on door hardware

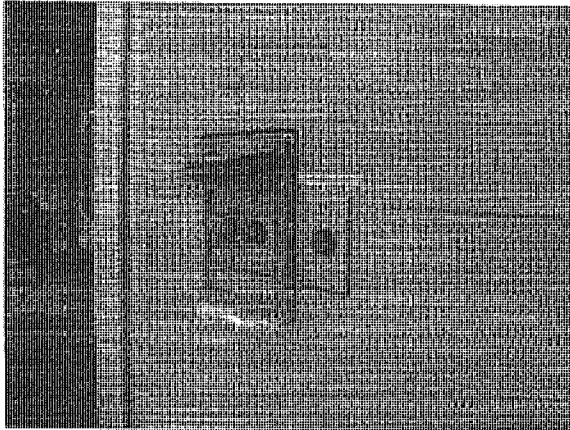


Figure 9. Corrosion on control buttons, cover was added to minimize damage

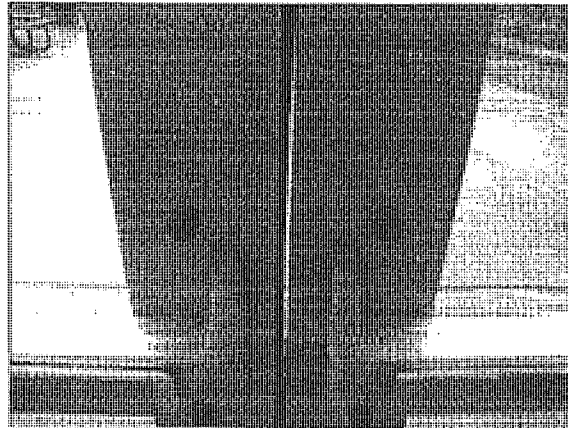


Figure 10. Gap in door weather sealing, corrosion on hardware

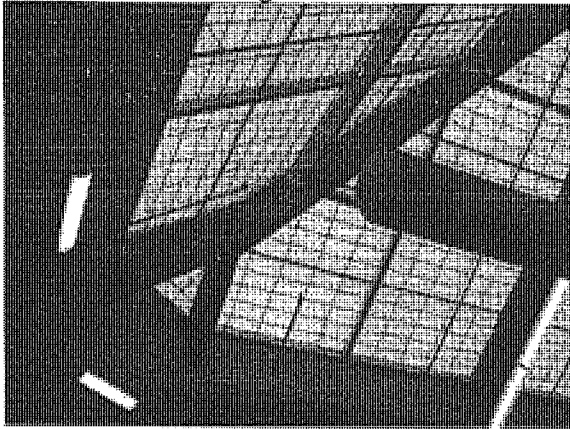


Figure 11. Condensate on translucent panels causing minor damage to glue-lams

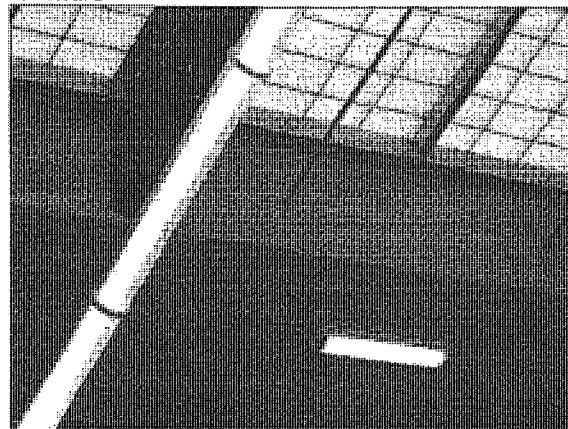


Figure 12. Condensate on translucent panels running down aluminum frames and is saturating walls

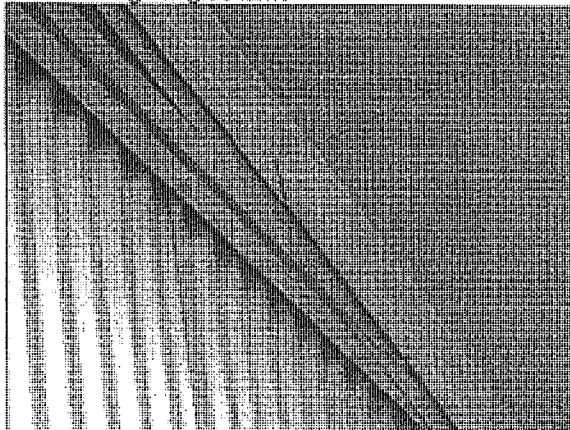


Figure 13. Corrosion of building materials evident on exterior from previous chlorine and moisture laden air leakage

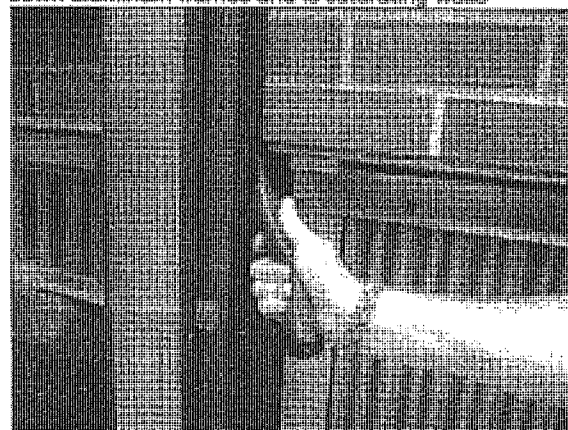


Figure 14. Smoke puffer showing air leakage into the building due to negatively pressurized natatoriums

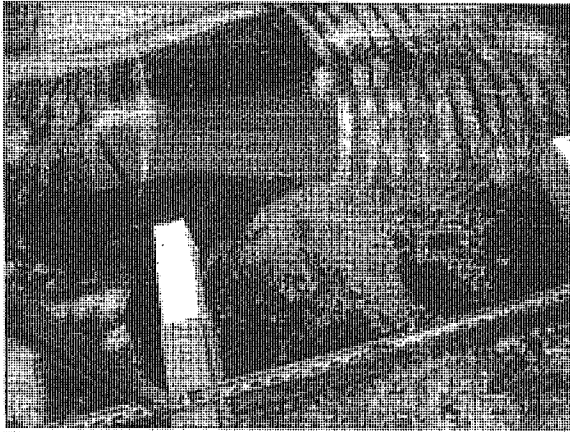


Figure 15. Ponding on roof near mechanical units

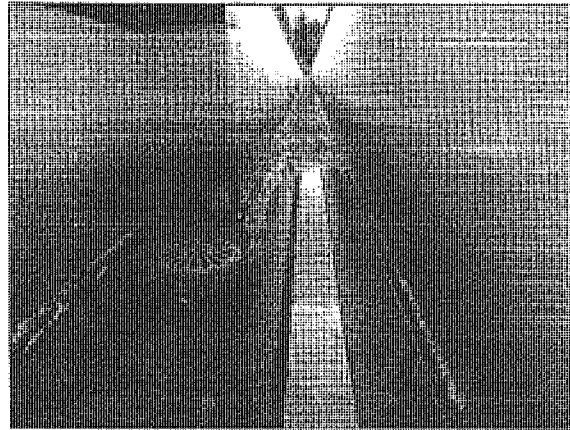


Figure 16. Clogged roof drain and ponding at base of Beach natatorium roof section

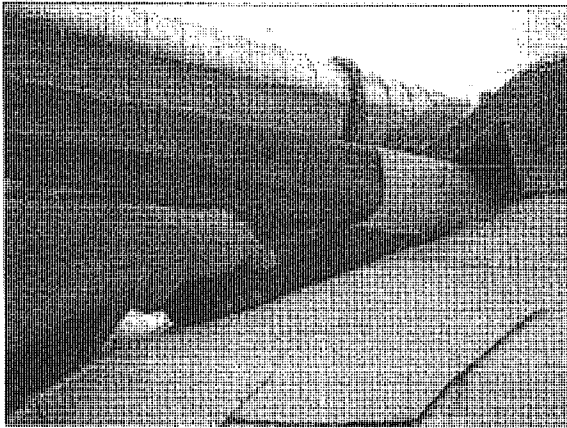


Figure 17. Air leakage at mechanical unit support penetration shows negative pressure on natatorium spaces

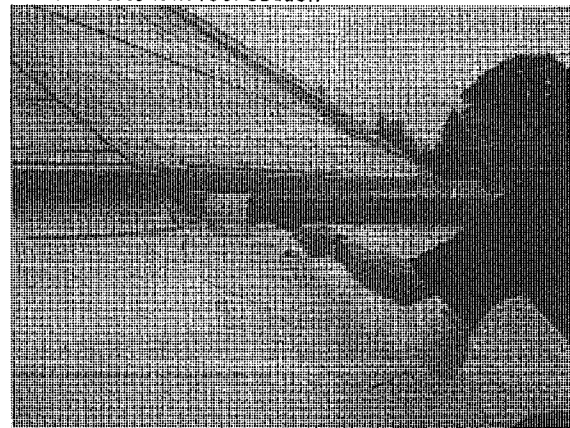


Figure 18. Rust colored on roofing below air leak

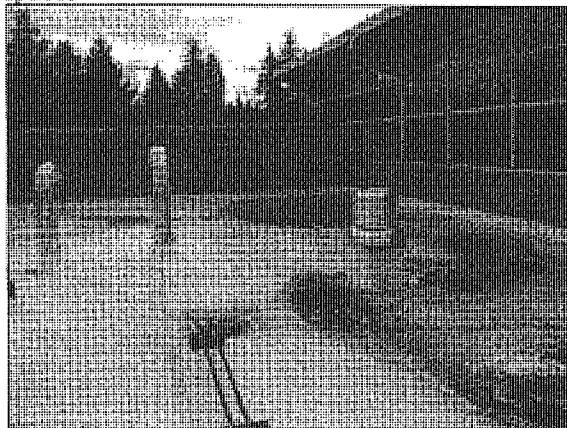


Figure 19. Ponding on roof near lobby and over racquetball courts

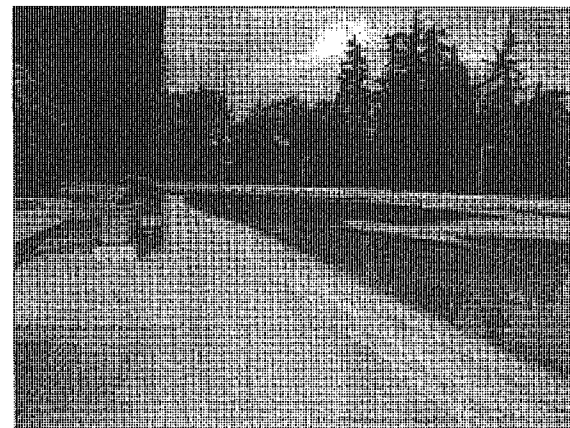


Figure 20. Ponding on roof near lobby and over racquetball courts



Figure 21. Evidence of in-wall corrosion being pushed out by previously positive natatorium pressure

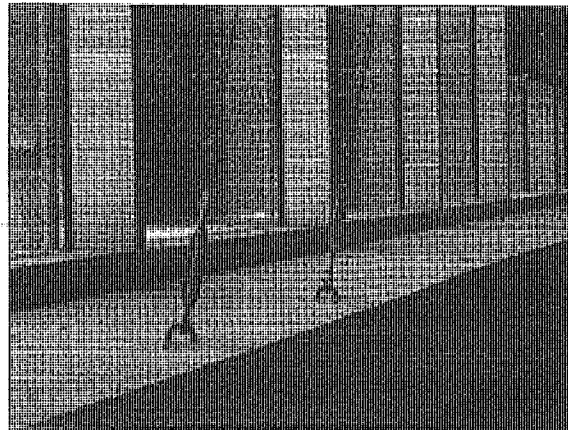


Figure 22. Corrosion on mechanical hangers in beach natatorium

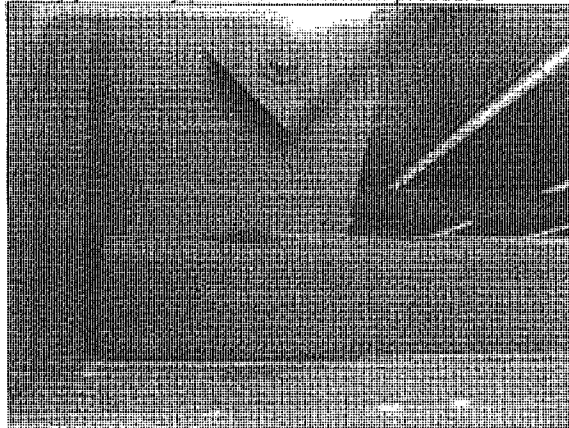


Figure 23. Rust dust has accumulated at the bottom of structural steel members in the beach natatorium

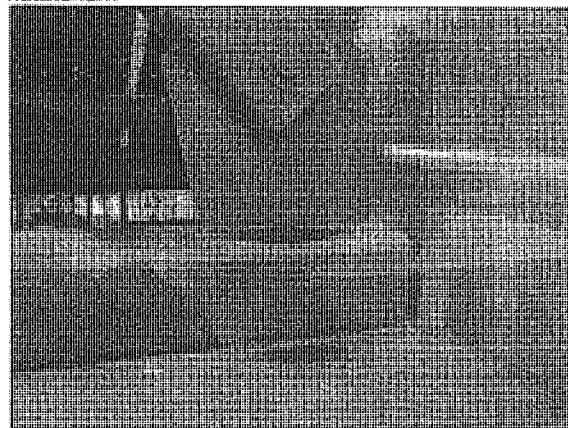


Figure 24. Rust dust has accumulated at the bottom of structural steel members in the beach natatorium

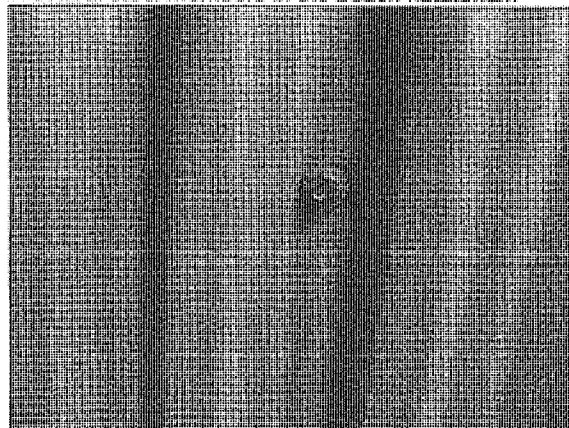


Figure 25. Surface rust on corrugated metal wall panels appears to be due to failed coating/painting and is likely unrelated to interior conditions



Figure 26. Rust staining on roof membrane from previous pressurized air leakage at a mechanical support penetration

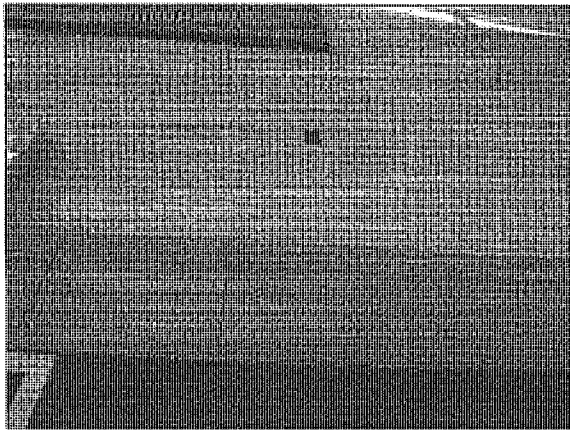


Figure 27. Corrosion on junction box cover



Figure 28. Corrosion on eye bolts and chain holding up clock

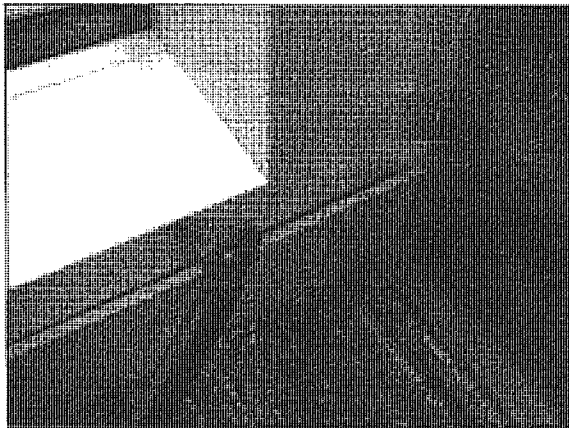


Figure 29. Air leakage into natatorium from adjacent hallway demonstrates current negative pressure

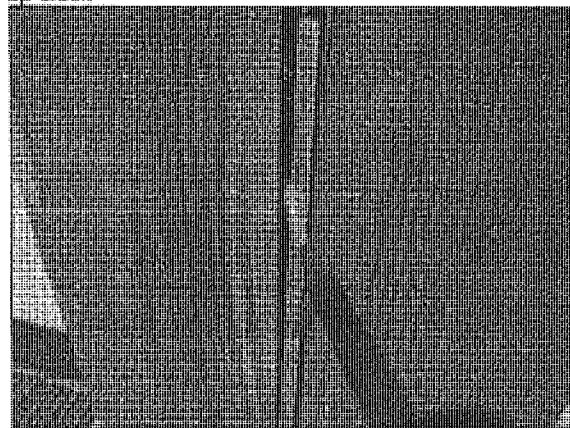


Figure 30. Air leakage into natatorium from adjacent hallway demonstrates current negative pressure

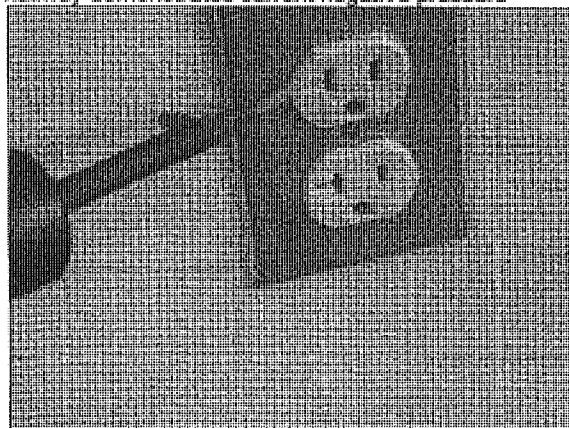


Figure 31. Air leakage into natatorium from adjacent hallway demonstrates current negative pressure

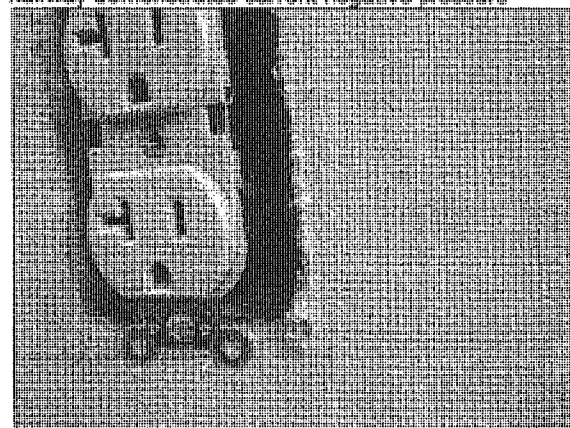


Figure 32. Air leakage into natatorium from adjacent hallway demonstrates current negative pressure

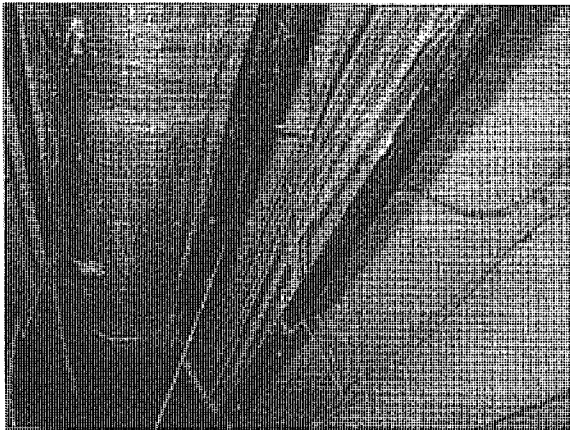


Figure 33. View above ceiling tiles in hallway showing no corrosion from previous air leakage from natatorium

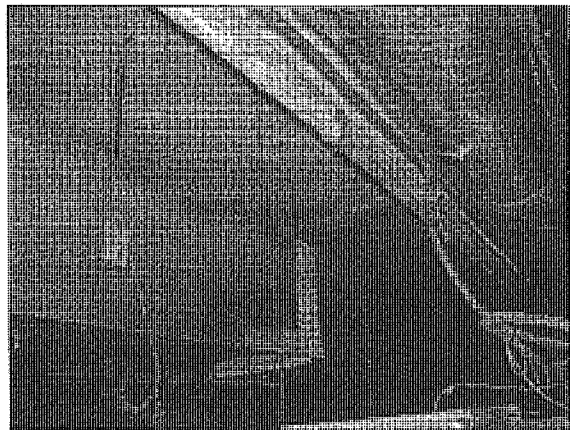


Figure 34. View above ceiling tiles in hallway showing no corrosion from previous air leakage from natatorium

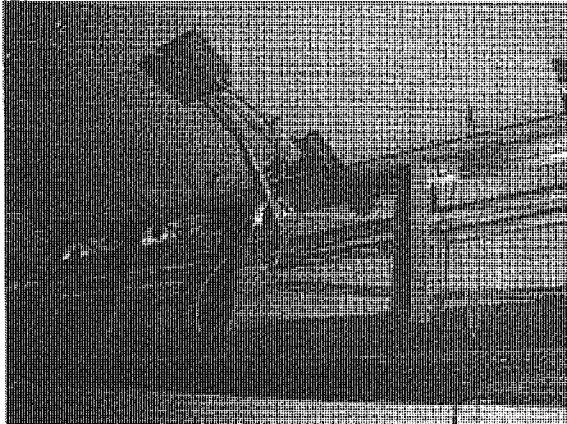


Figure 35. View above ceiling tiles in lobby showing no corrosion from previous air leakage from natatorium

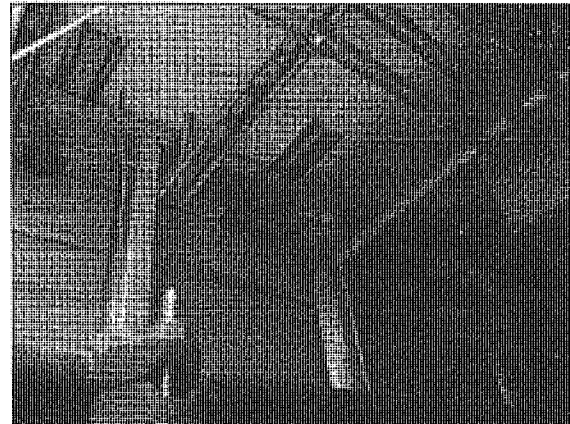


Figure 36. View above ceiling tiles in lobby showing no corrosion from previous air leakage from natatorium

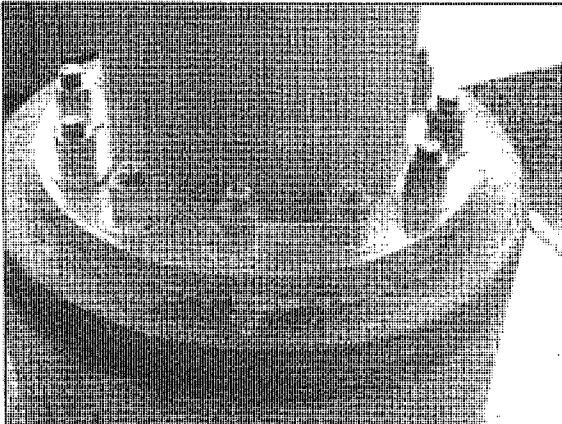


Figure 37. Corrosion on fasteners of water slide support

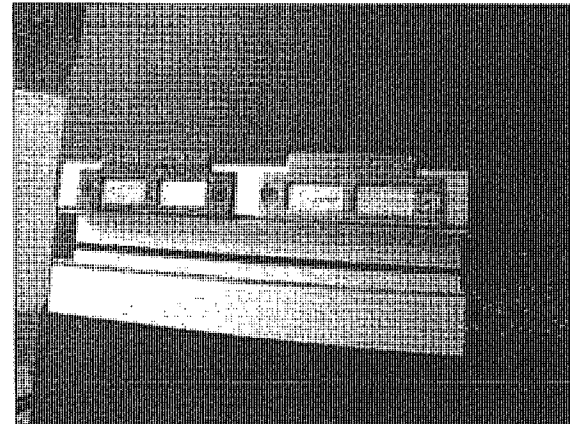


Figure 38. Corrosion test in progress door hardware showing extensive damage to 630 Stainless

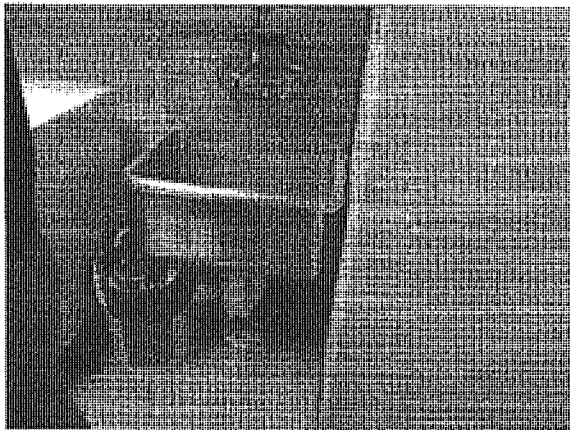


Figure 39. Corrosion on stainless steel sink in staff training room

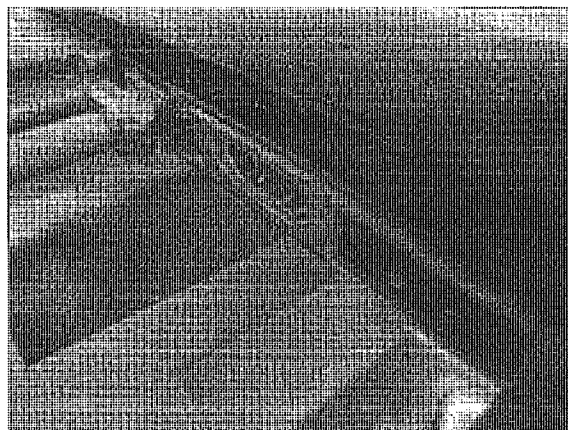


Figure 40. Corrosion on data/display connections on computer in staff training room

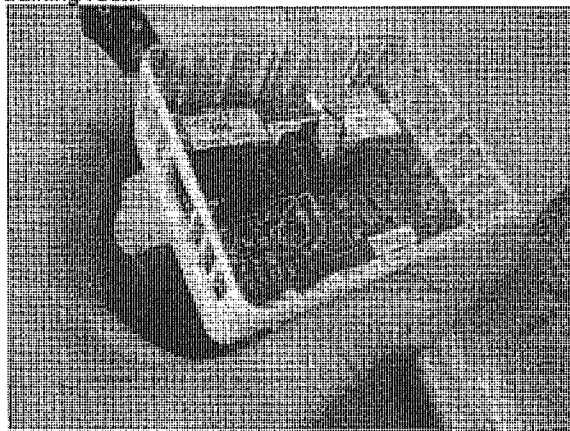


Figure 41. Corrosion on electronic components in wall sensor in staff training room



Figure 42. Corrosion on ceiling grid hangers in staff training room

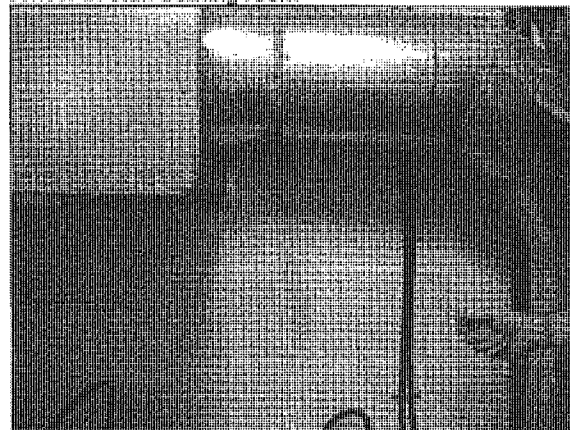


Figure 43. Extensive moisture damage to drywall in boiler room has an unknown source but is believed to be originating next to the tube slide loading zone above

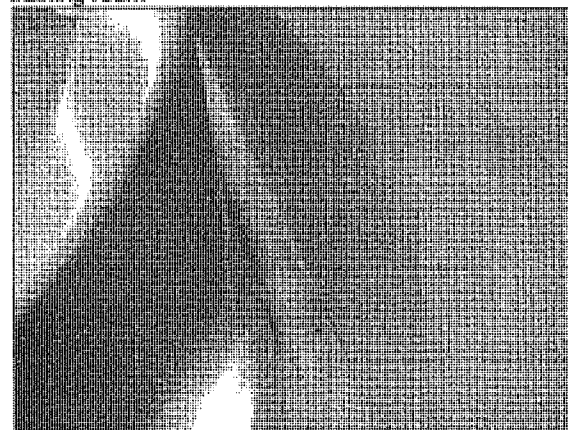


Figure 44. Extensive moisture damage to drywall in boiler room has an unknown source but is believed to be originating next to the tube slide loading zone above

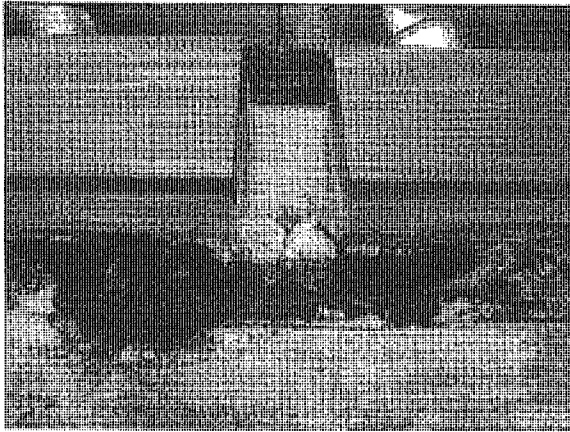


Figure 45. Scupper on high roof above boiler room/slide loading is a possible source for the unknown moisture damage in the boiler room

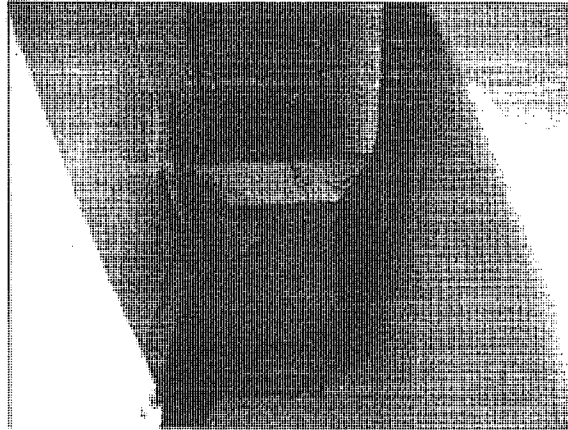


Figure 46. Scupper on high roof above boiler room/slide loading is a possible source for the unknown moisture damage in the boiler room

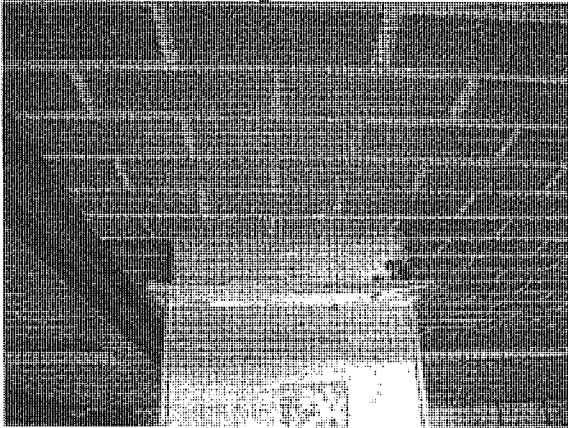


Figure 47. Duct penetration serving slide loading area is a possible source for unknown moisture damage in boiler room

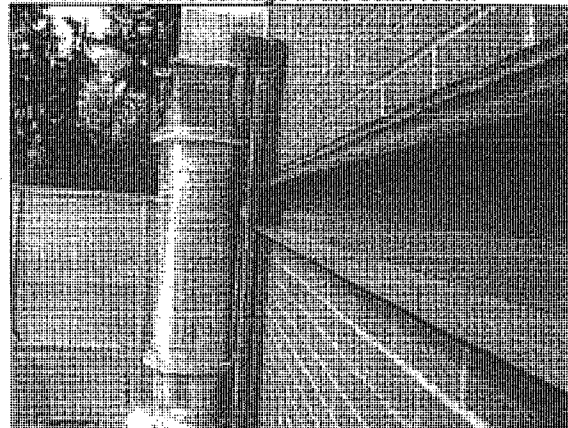


Figure 48. Duct penetration serving slide loading area is a possible source for unknown moisture damage in boiler room

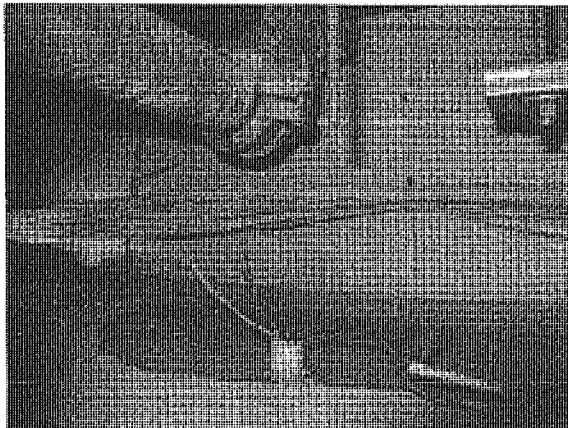


Figure 49. Leak reported by staff in staff training room appears to be either a plumbing leak from the fire sprinkler pipe or coming from above it

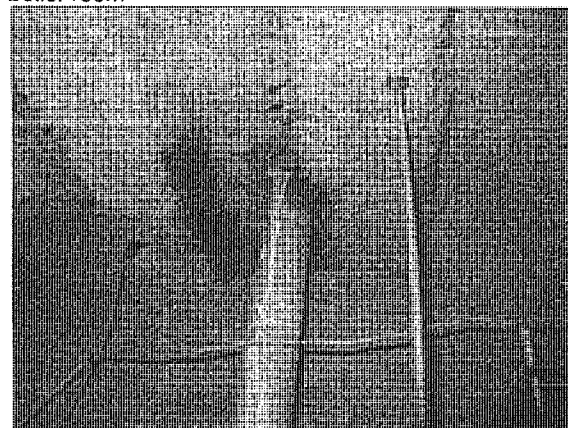


Figure 50. Leak reported by staff in staff training room appears to be either a plumbing leak from the fire sprinkler pipe or coming from above it

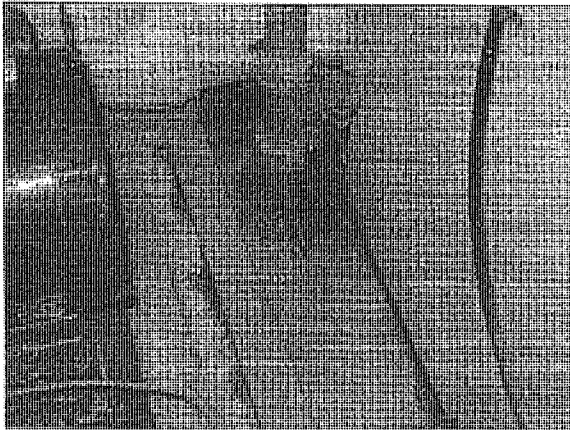


Figure 51. Fire sprinkler pipe shown from above with extra sealant at floor – proximity to moisture damage in boiler room wall suggests the leak below is related to wall damage

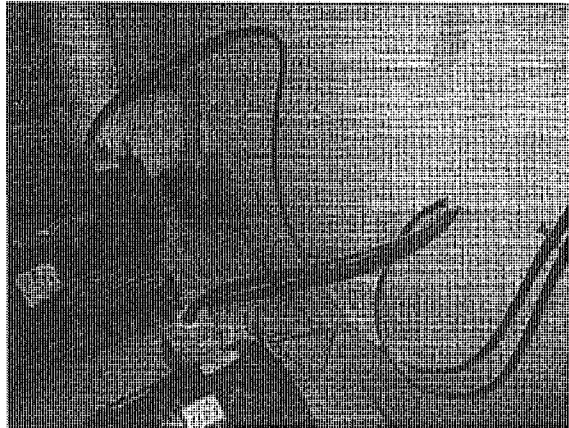


Figure 52. Fire sprinkler pipe shown from above with extra sealant at floor – proximity to moisture damage in boiler room wall suggests the leak below is related to wall damage

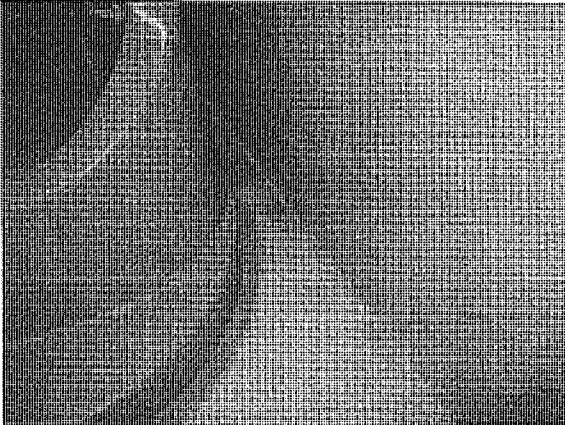


Figure 53. Maintenance staff added sealant at base of tile wall next to tube slide in hopes of solving the unknown moisture damage in the boiler room below



Figure 54. Maintenance staff added sealant at base of tile wall next to tube slide in hopes of solving the unknown moisture damage in the boiler room below

## Infrared Analysis of Natatorium Spaces

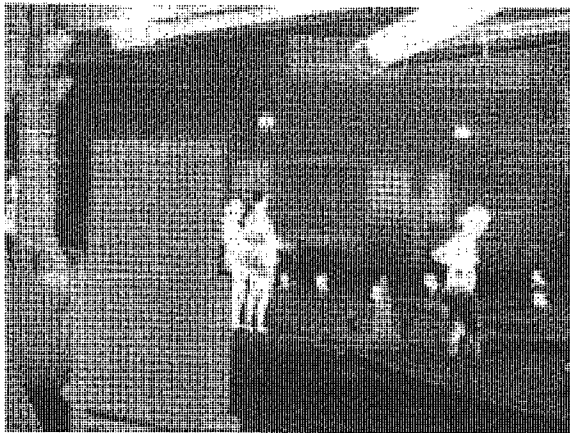


Figure 55. Infrared showing no apparent thermal anomalies

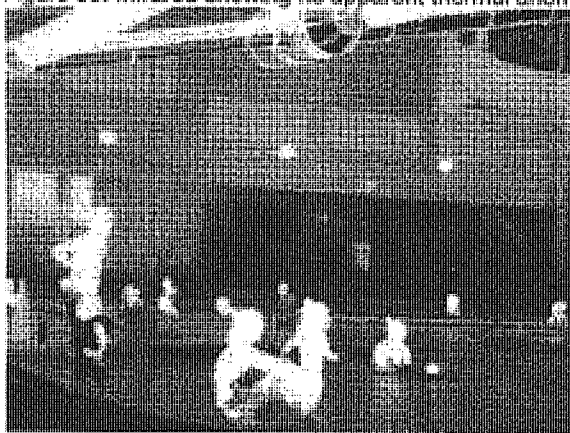
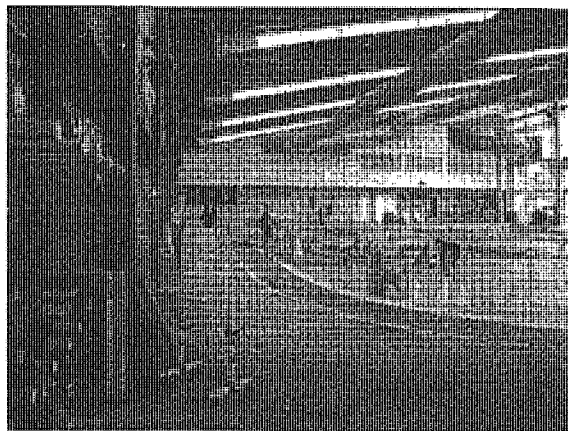


Figure 56. Infrared showing no apparent thermal anomalies

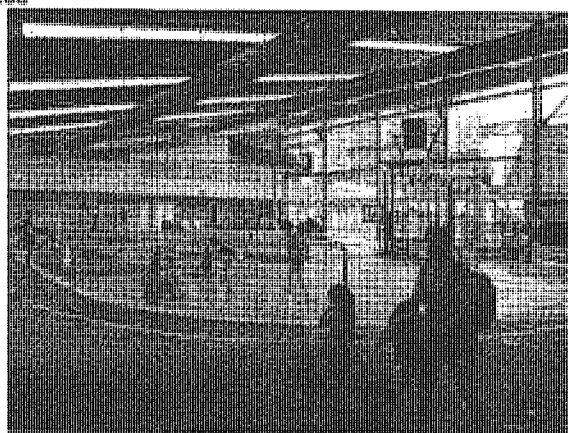
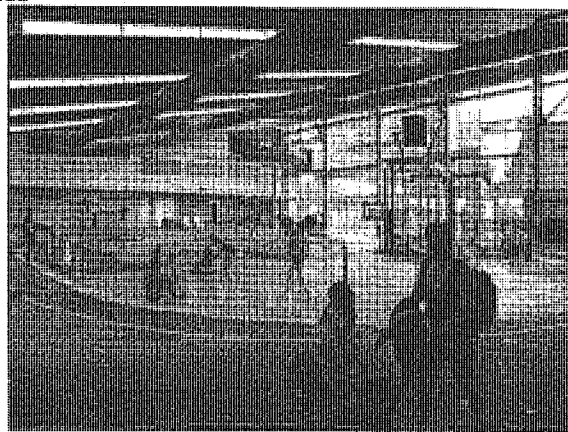


Figure 57. Infrared showing no apparent thermal anomalies



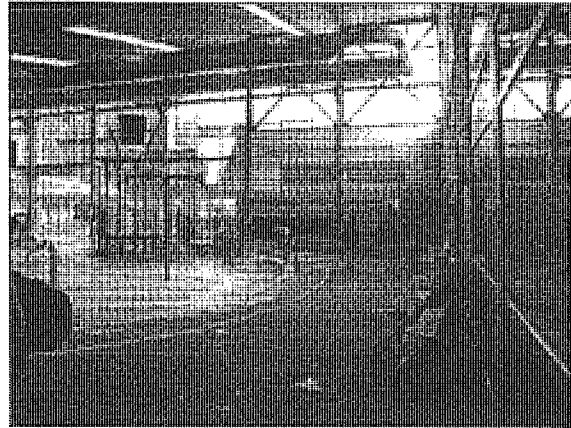
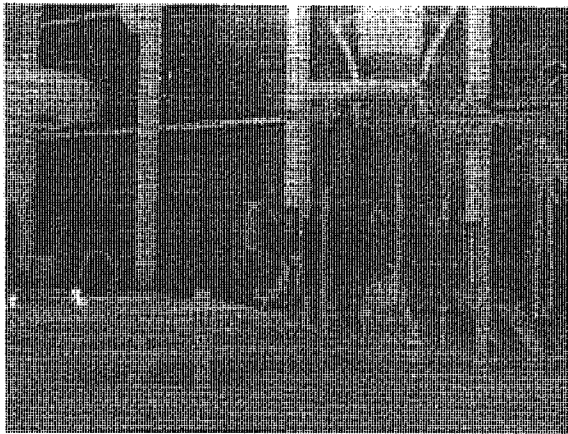


Figure 58. Infrared showing no apparent thermal anomalies



Figure 59. Infrared showing thermal bridging and possible air leakage into the wall cavity

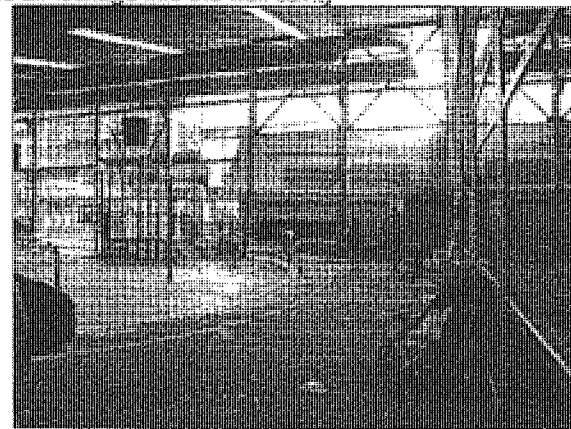
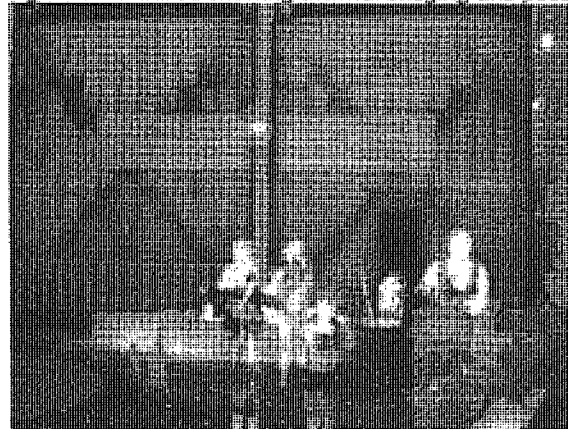


Figure 60. Infrared showing thermal bridging and air leakage

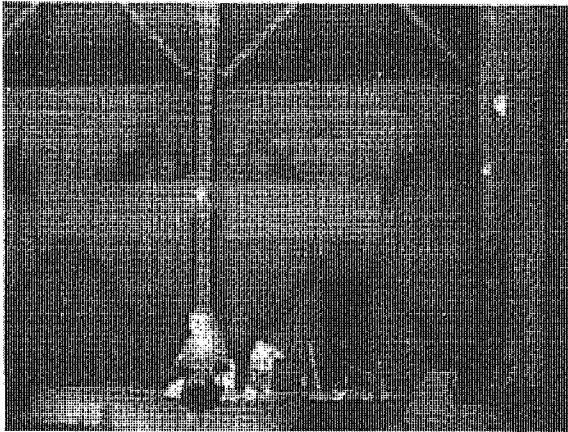


Figure 61. Infrared showing thermal bridging and air leakage

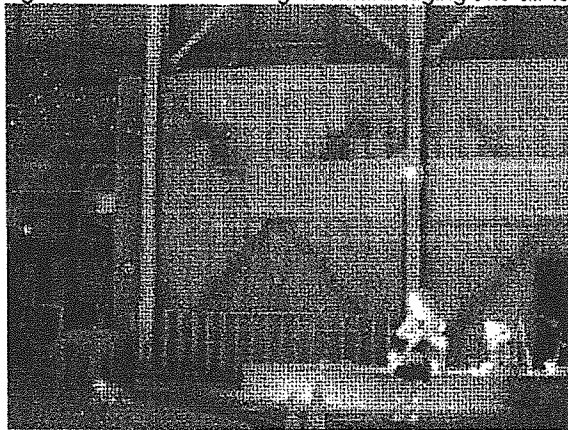
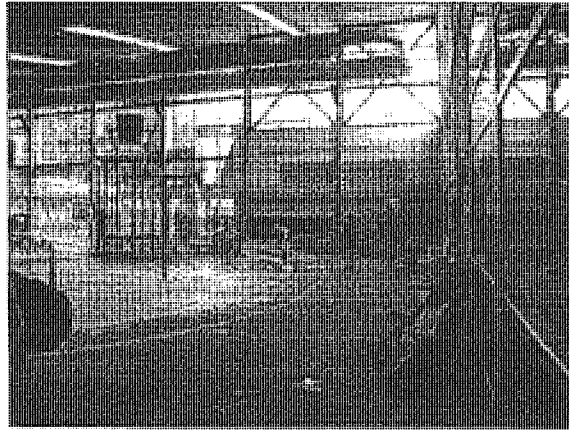


Figure 62. Infrared showing thermal bridging and air leakage

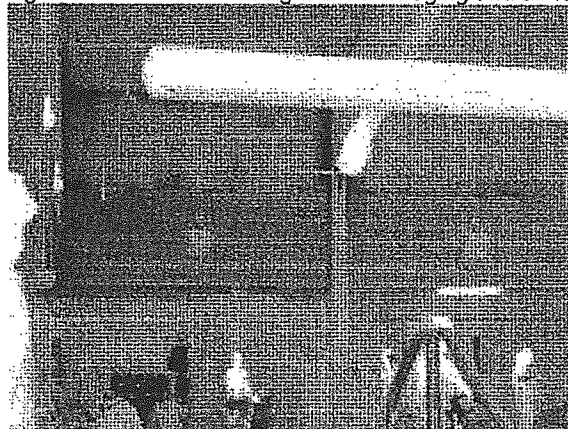
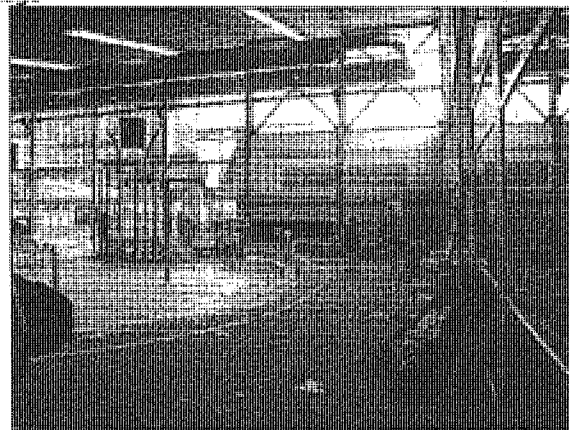
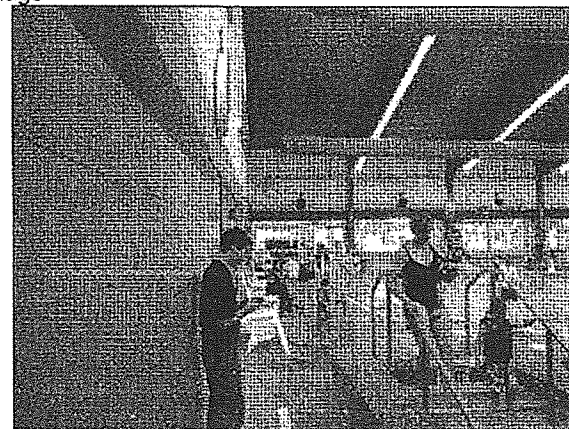


Figure 63. Infrared showing air leakage at the glu-lam/wall interface



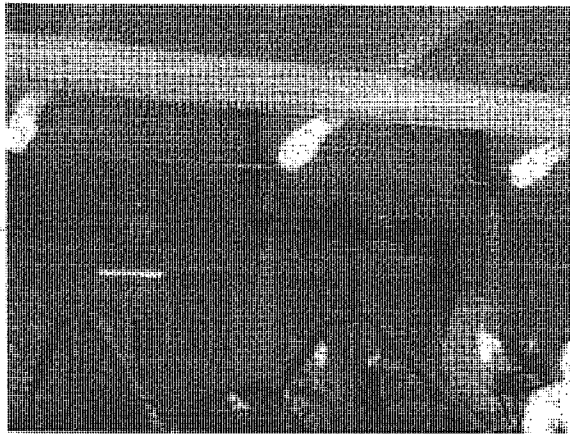


Figure 64. Infrared showing air leakage at the glu-lam/wall interface

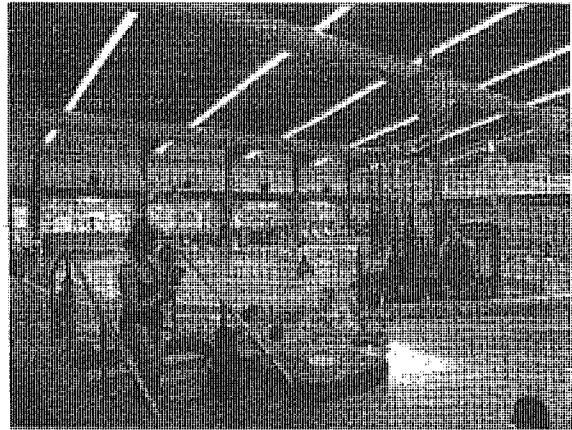


Figure 65. Infrared showing air leakage at the glu-lam/wall interface

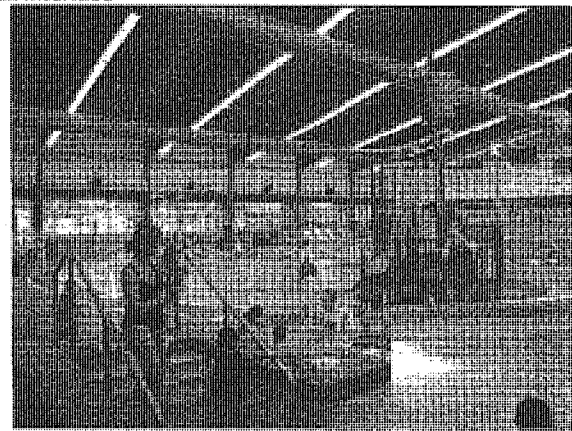
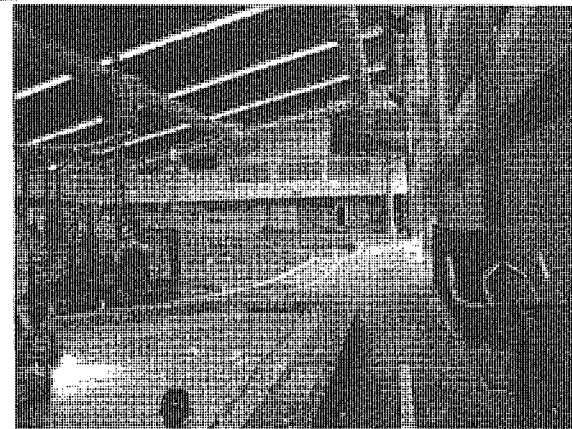


Figure 66. Infrared showing air leakage at the glu-lam/wall interface



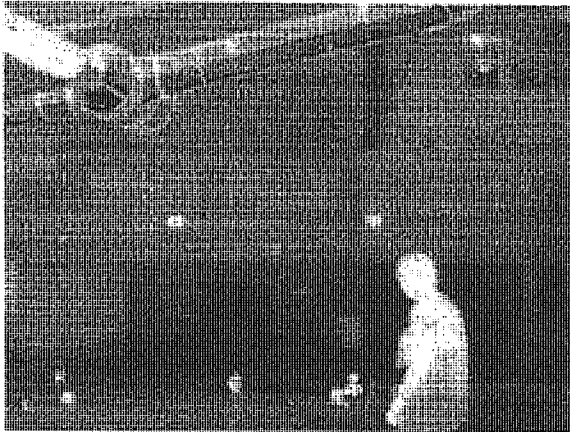


Figure 67. Infrared showing no apparent thermal anomalies

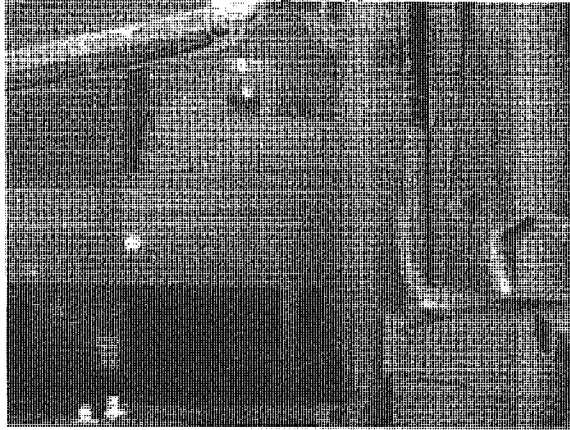
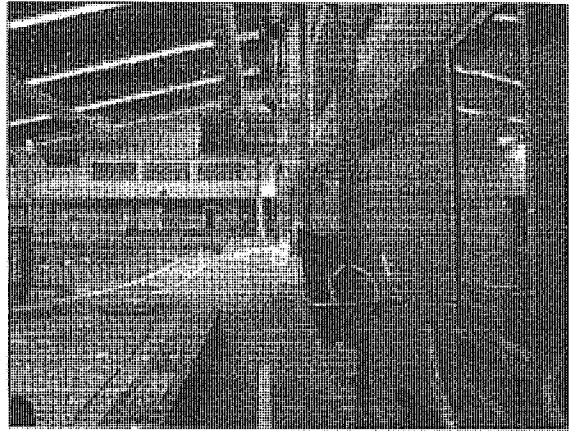


Figure 68. Infrared showing no apparent thermal anomalies

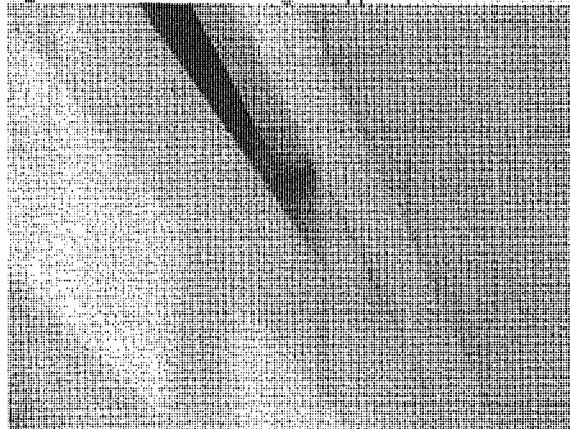
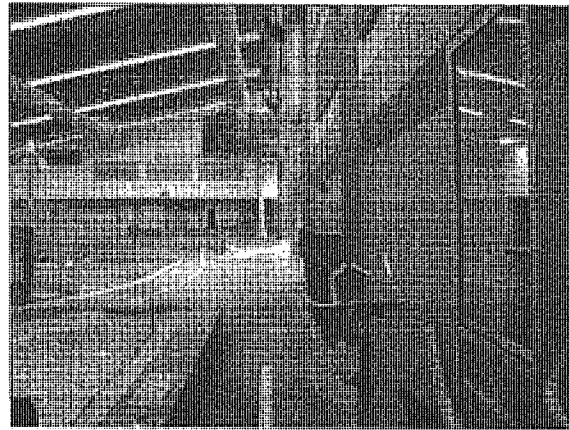


Figure 69. Infrared showing air leakage at the glu-lam/wall interface



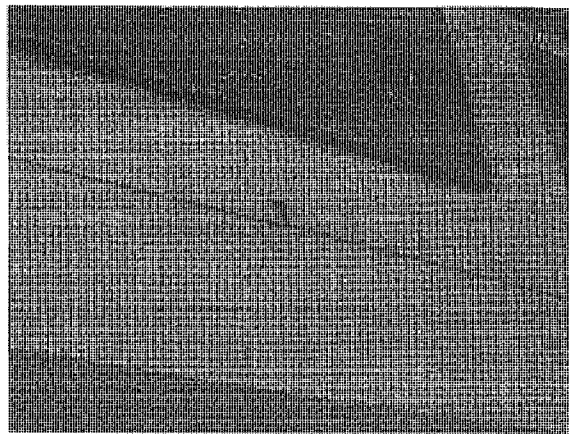
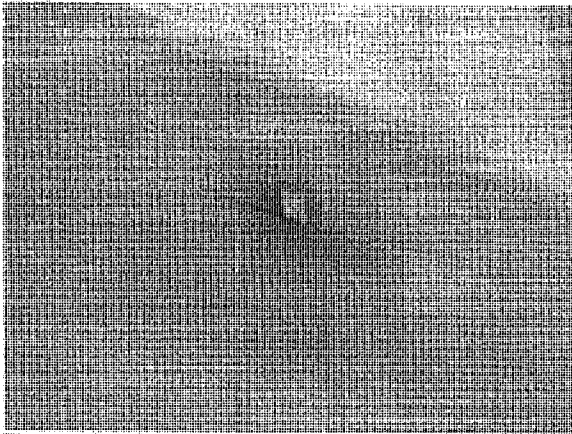


Figure 70. Infrared showing air leakage at junction box cover

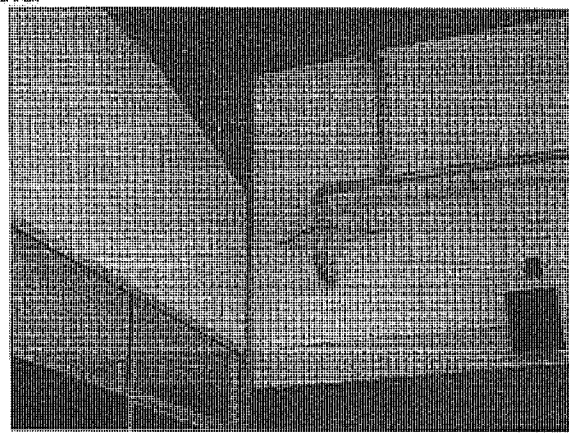
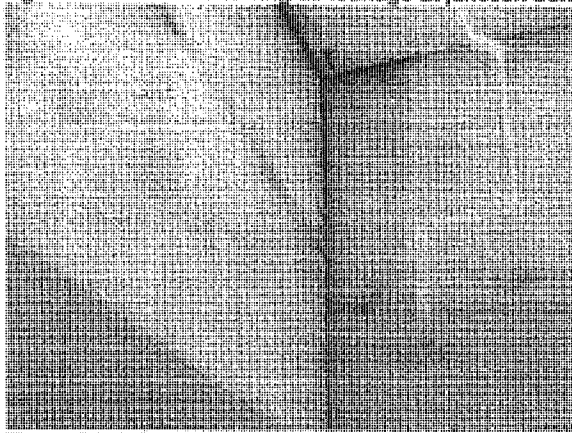


Figure 71. Infrared showing air leakage at the corner

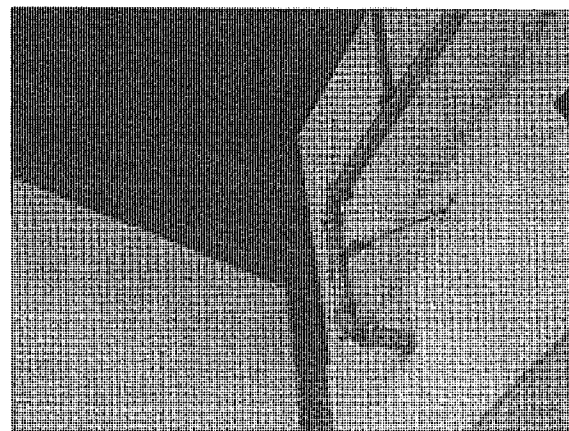
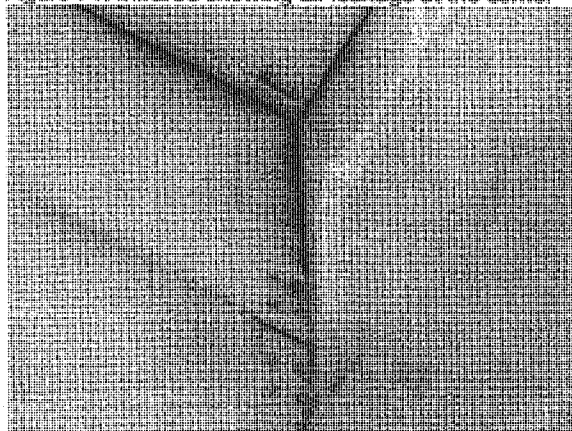


Figure 72. Infrared showing air leakage at the corner

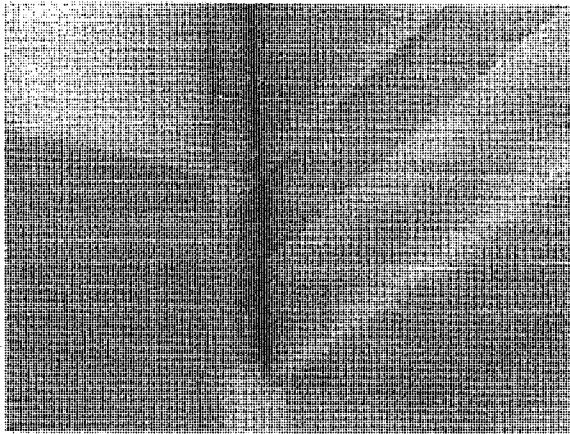


Figure 73. Infrared showing air leakage at the corner

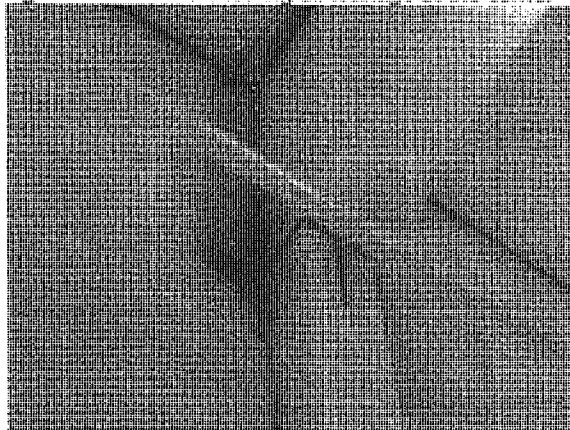
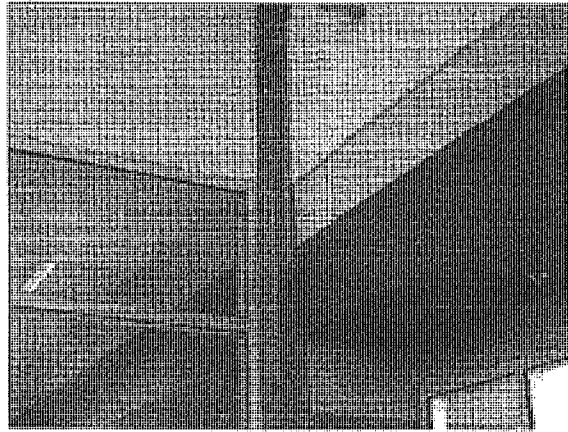


Figure 74. Infrared showing air leakage at wall to column/moist/ceiling interface

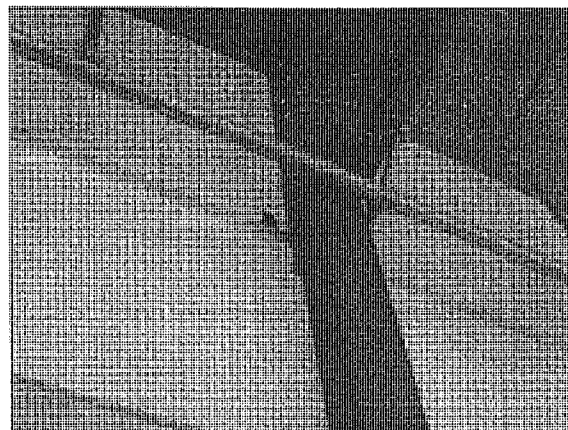


Figure 75. Infrared showing air leakage at windows and possible moisture loading in wall



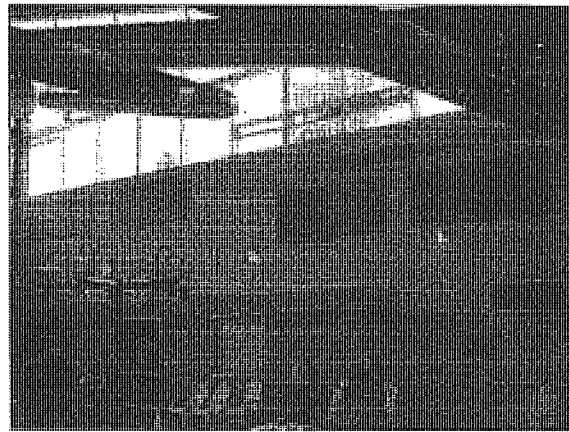
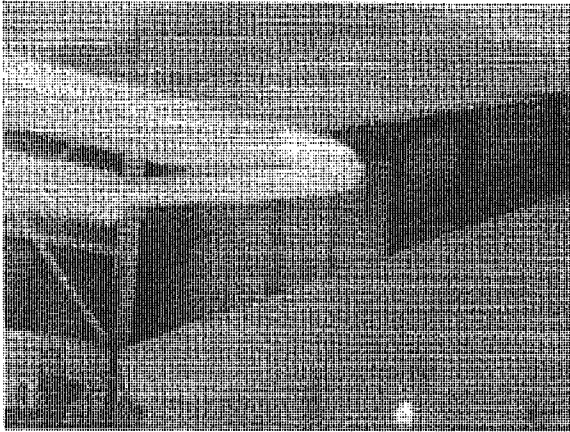


Figure 76. Infrared showing air leakage at windows and possible moisture loading in wall

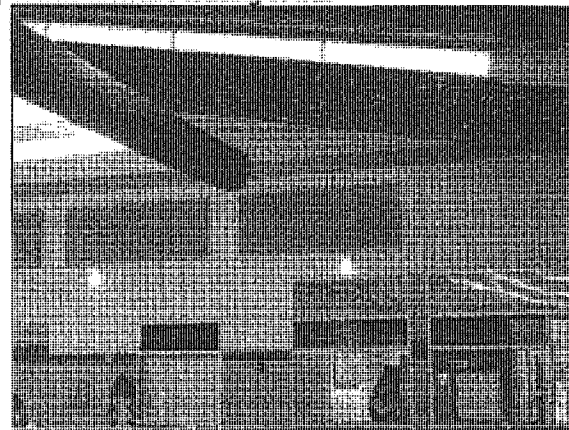
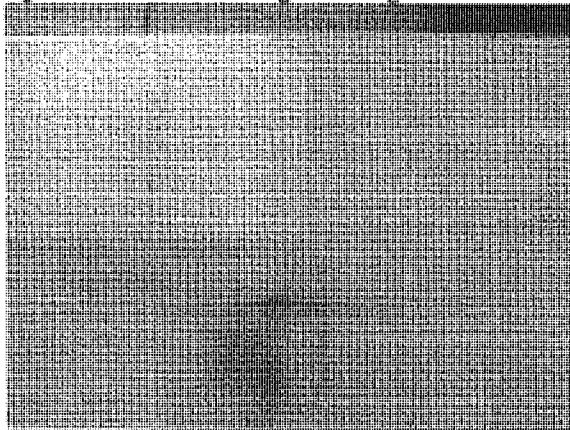


Figure 77. Infrared showing possible moisture loading in wall

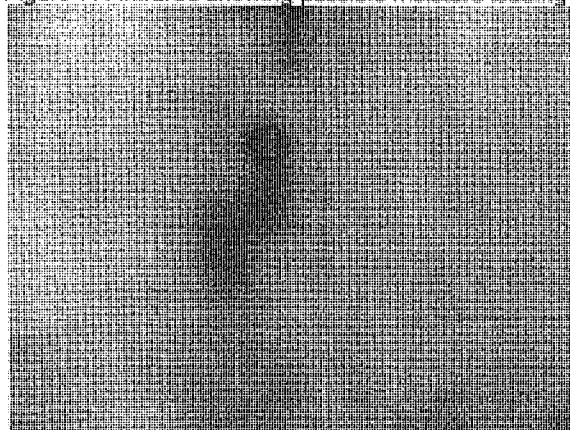


Figure 78. Infrared showing air leakage at junction box cover and possible moisture loading in wall

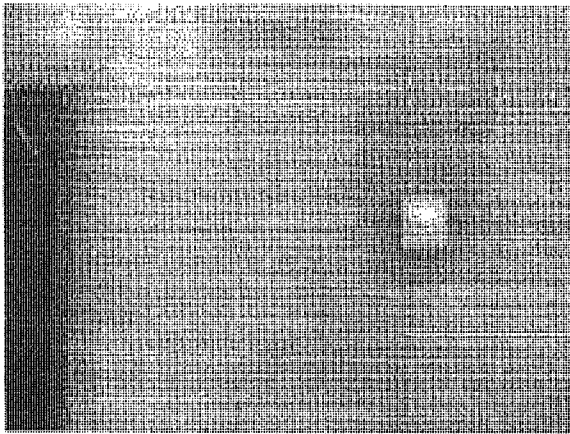


Figure 79. Infrared showing minor air leakage at wall mounted sensor

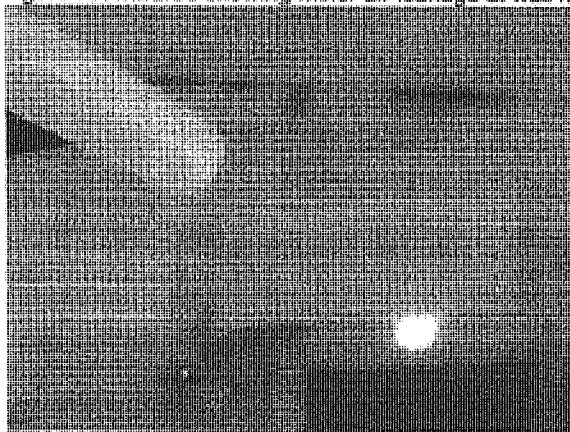
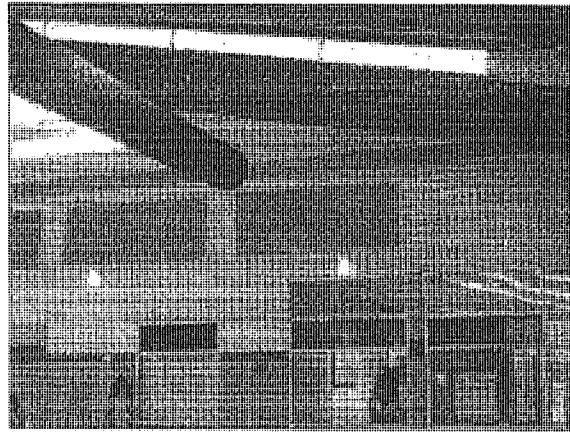


Figure 80. Infrared showing air leakage at windows and wall-to-ceiling transition and possible moisture loading in wall

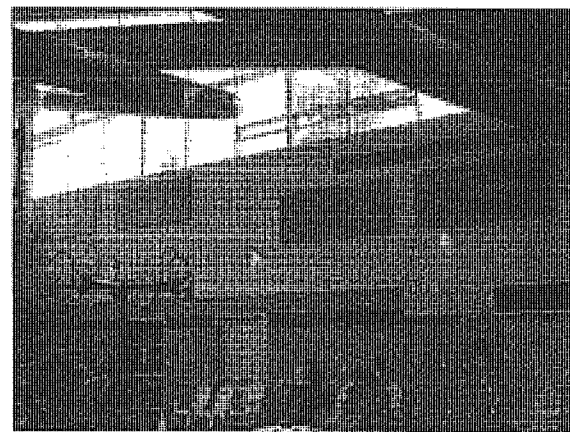
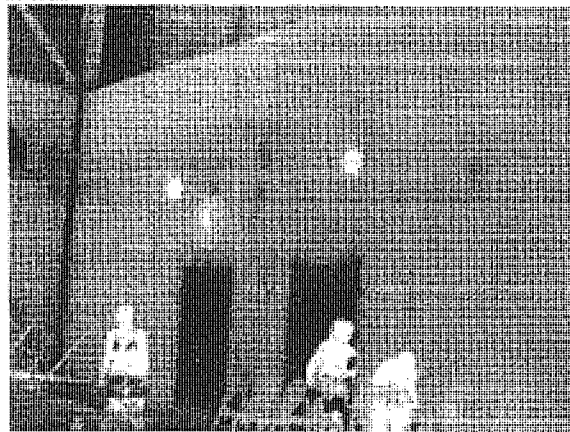
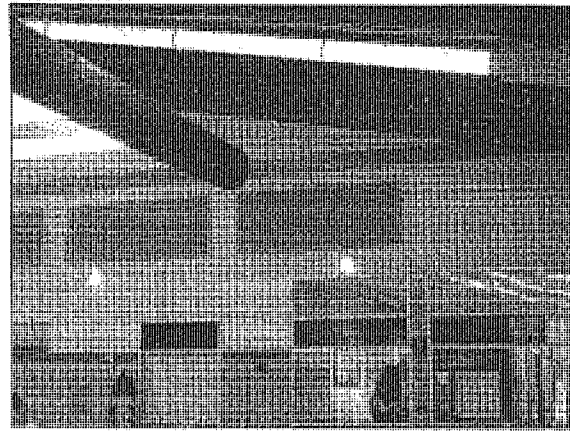


Figure 81. Infrared showing air leakage at windows and possible moisture loading in wall

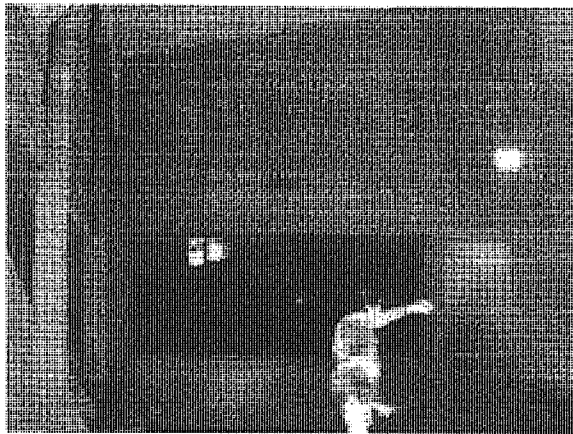


Figure 82. Infrared showing air leakage at corner and wall mounted sensor

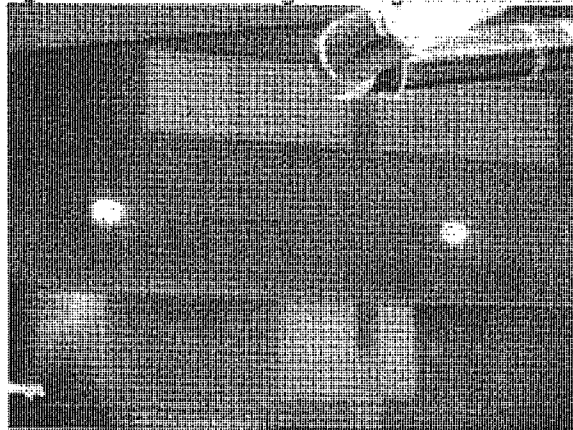
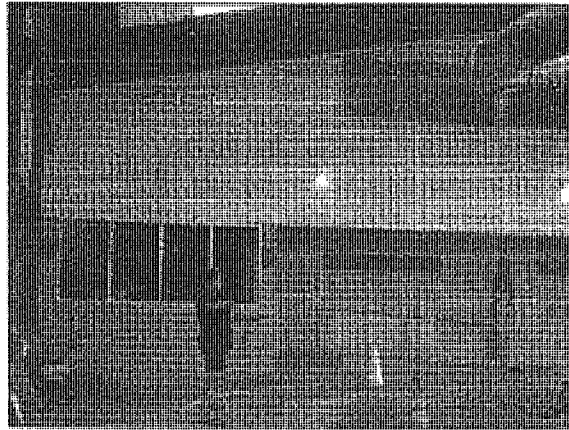


Figure 83. Infrared showing no apparent thermal anomalies

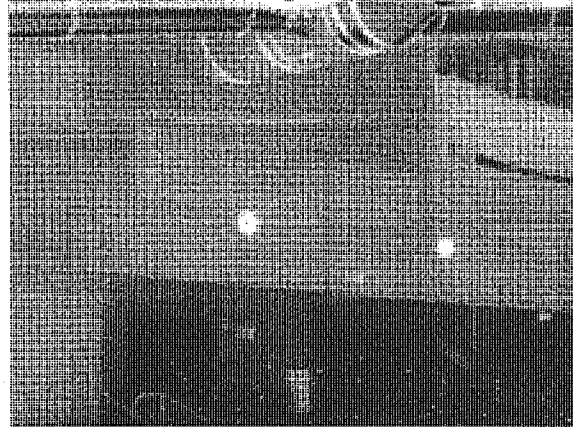
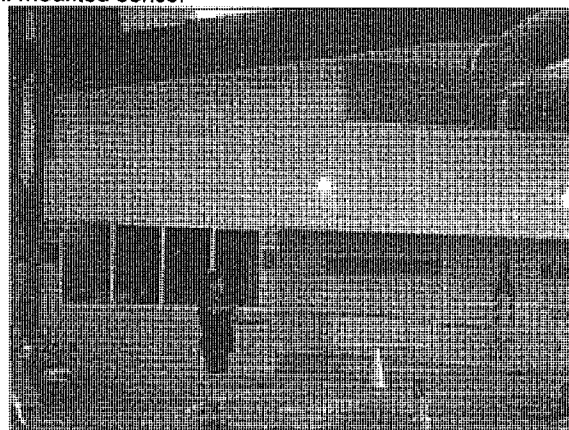
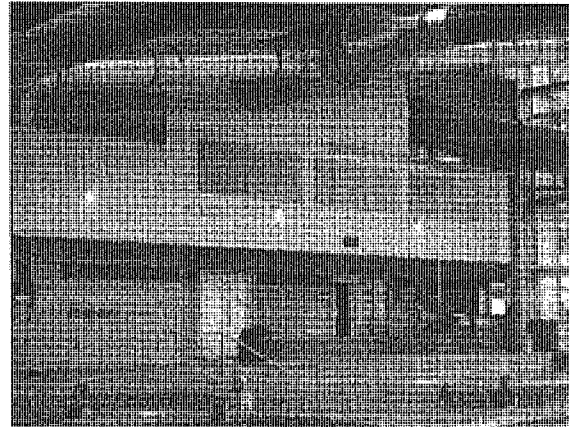


Figure 84. Infrared showing no apparent thermal anomalies



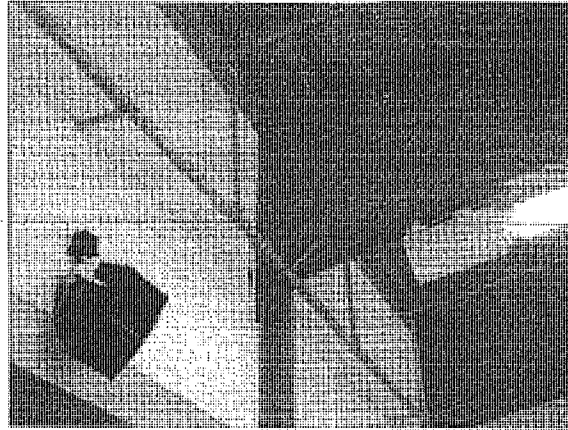
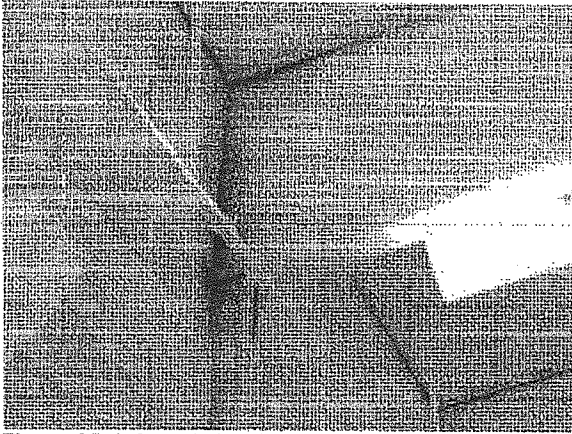


Figure 85. Infrared showing air leakage at wall to column/joist/ceiling interface

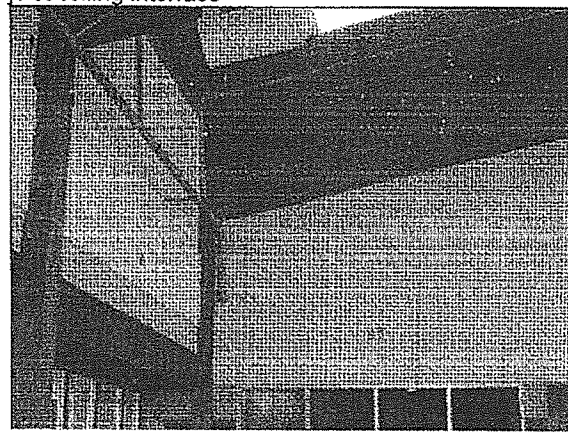
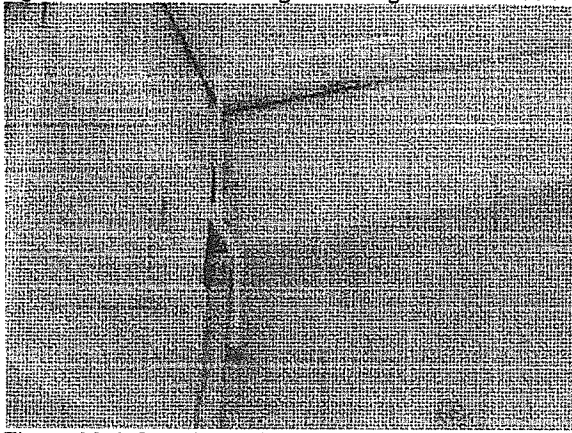


Figure 86. Infrared showing air leakage at wall to column/joist/ceiling interface

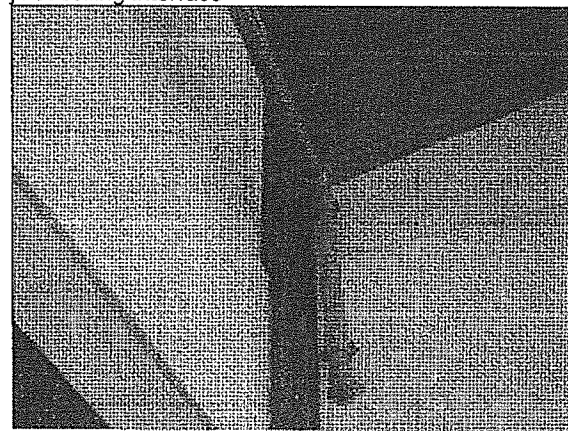
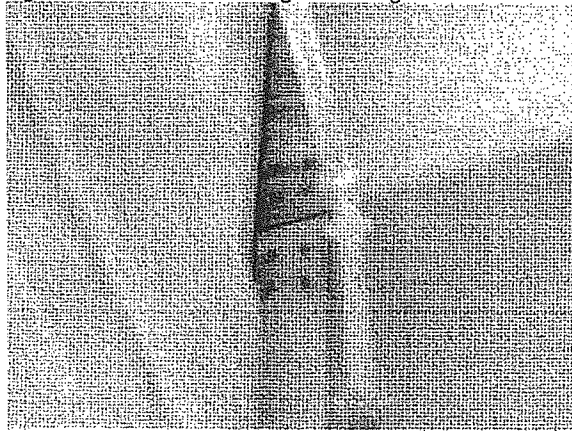


Figure 87. Infrared showing air leakage at wall to column/joist interface

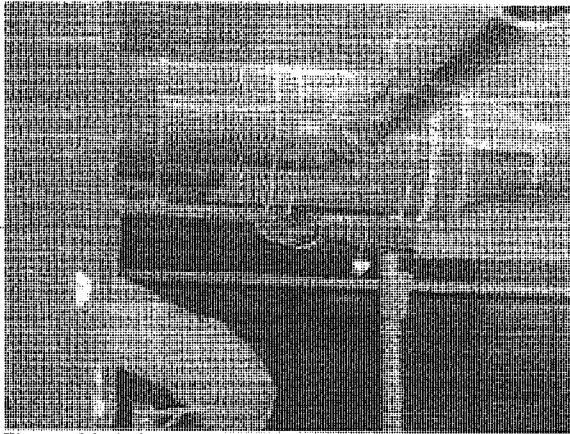


Figure 88. Infrared showing no apparent thermal anomalies

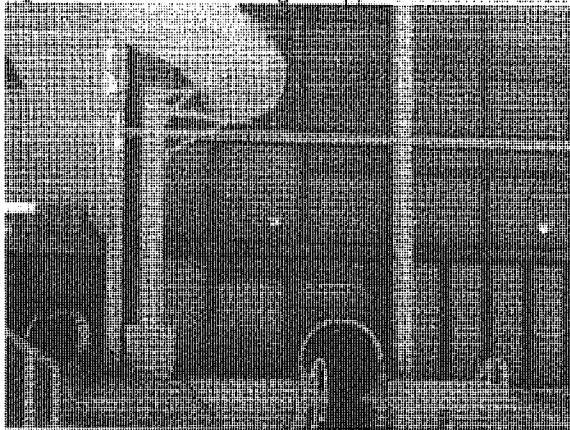
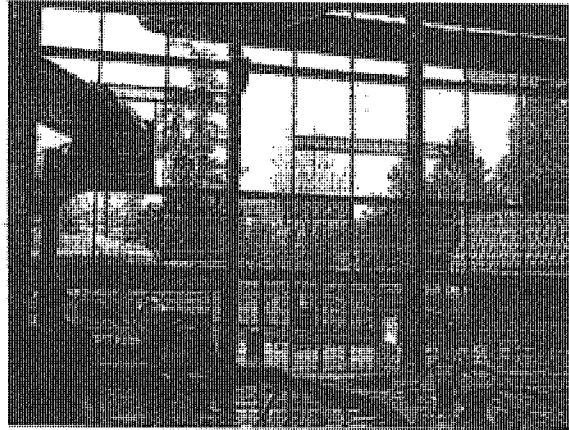


Figure 89. Infrared showing no apparent thermal anomalies

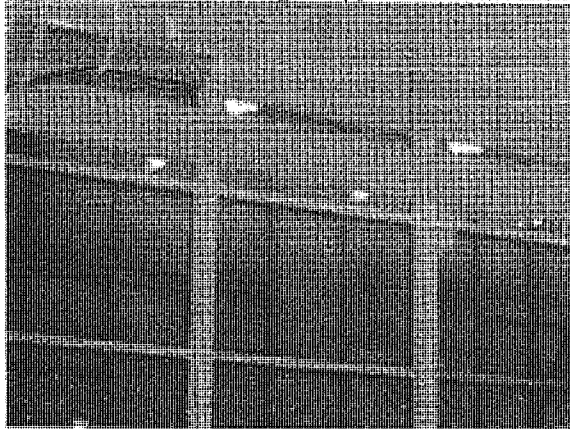
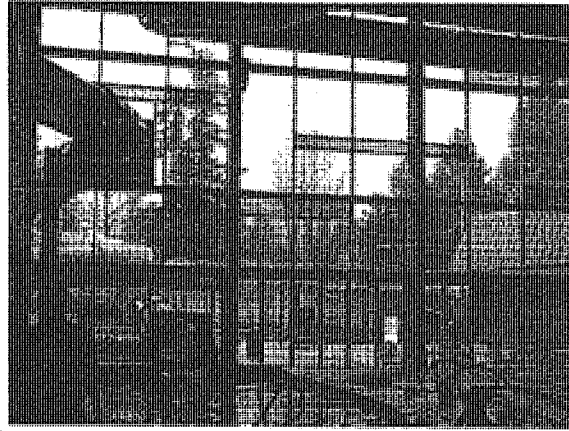
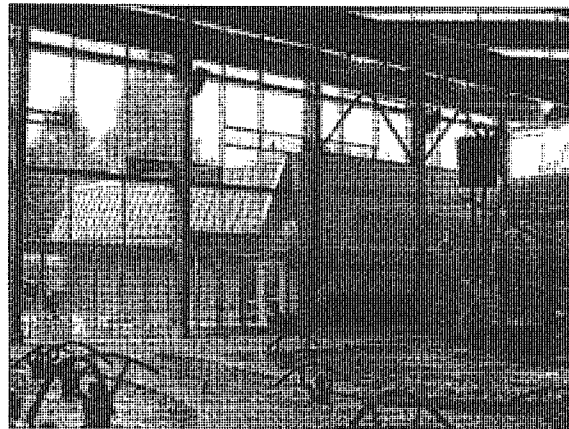


Figure 90. Infrared showing no apparent thermal anomalies



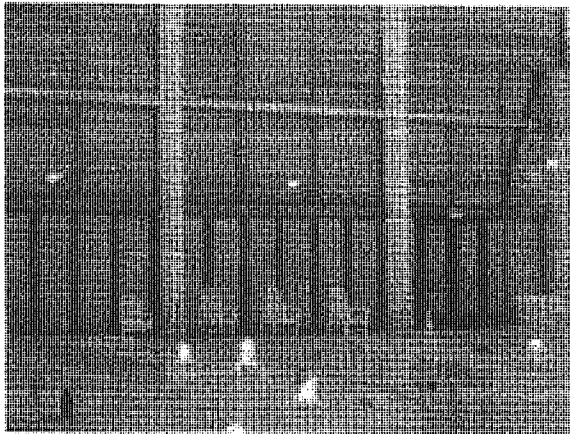


Figure 91. Infrared showing no apparent thermal anomalies

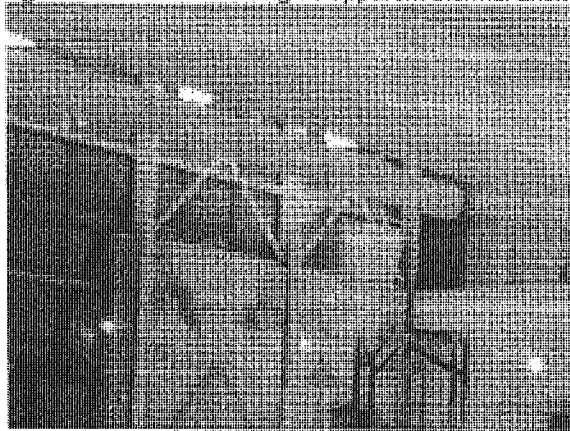
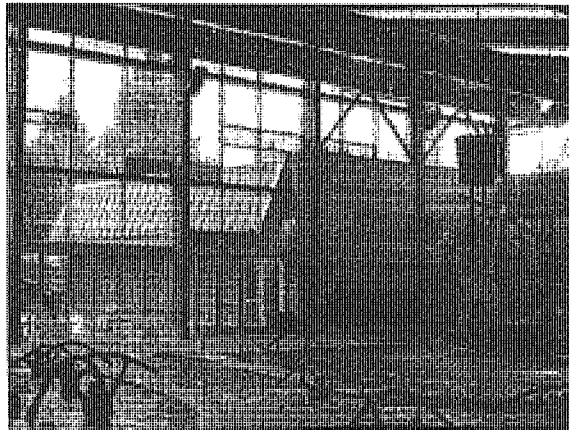


Figure 92. Infrared showing thermal bridging and air leakage in wall

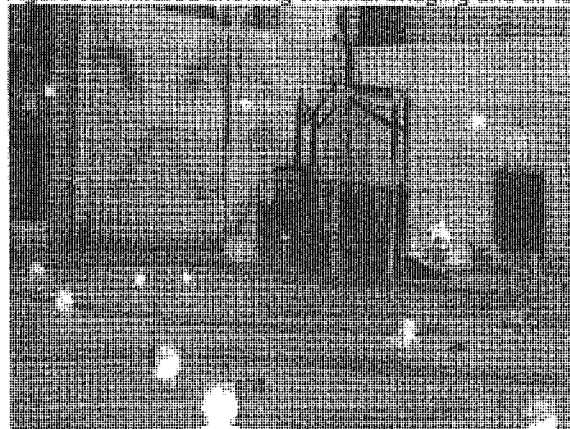
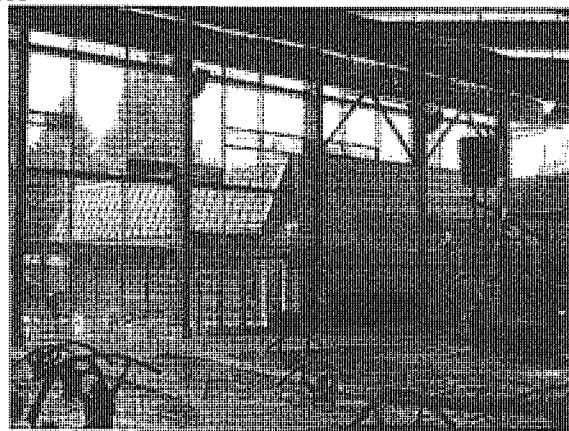
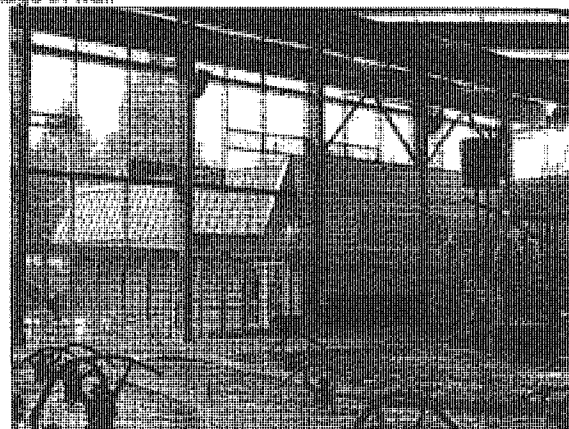


Figure 93. Infrared showing thermal bridging and air leakage in wall



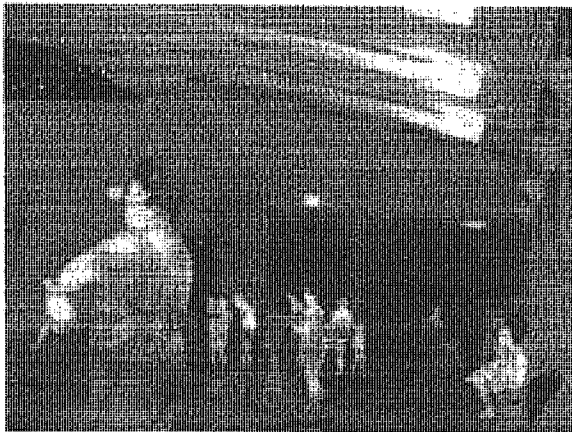


Figure 94. Infrared showing air leakage at wall to ceiling transition

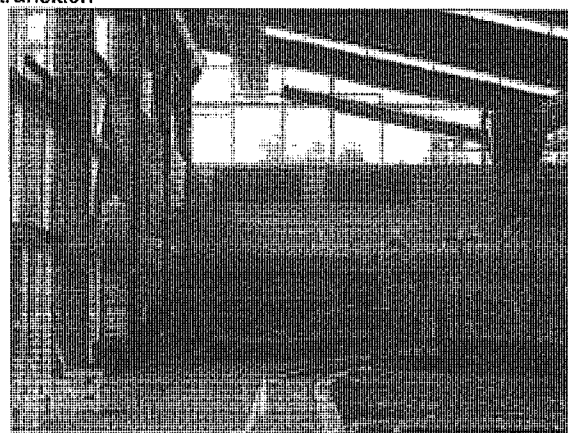
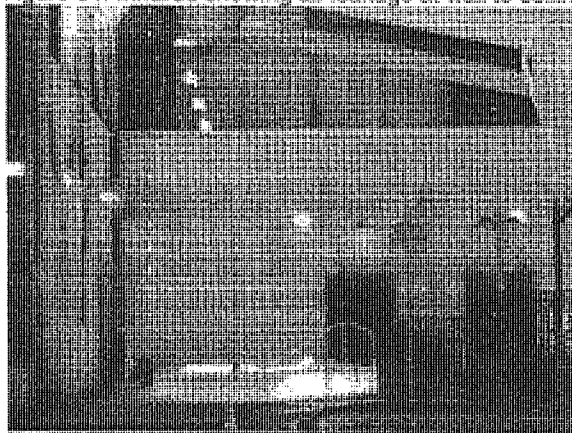


Figure 95. Infrared showing air leakage at windows and thermal bridging/possible moisture loading in the wall

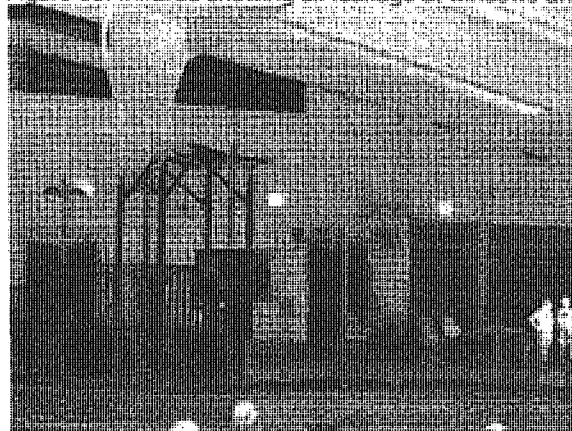


Figure 96. Infrared showing air leakage at windows and wall to ceiling transition as well as thermal bridging in the wall

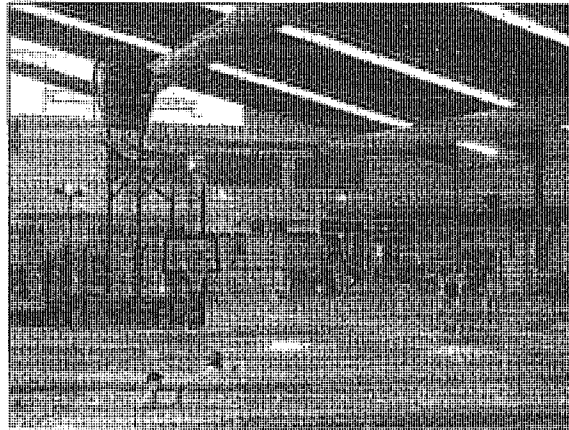
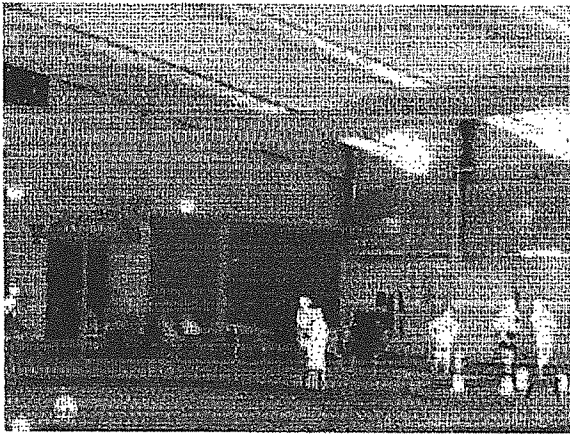


Figure 97. Infrared showing air leakage at columns, joists, wall to ceiling transitions, and windows

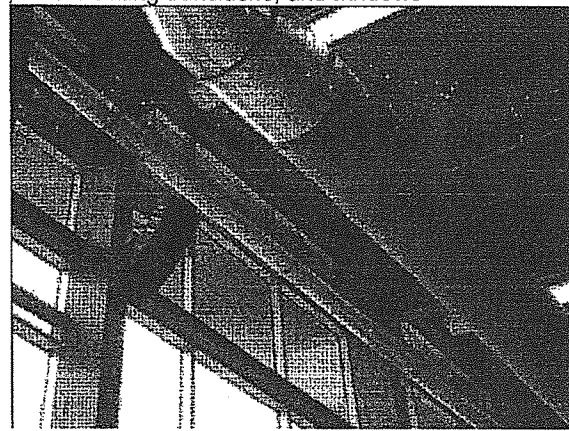
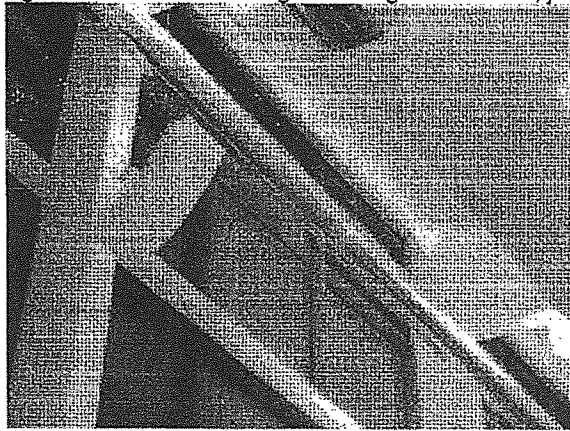


Figure 98. Infrared showing no apparent thermal anomalies

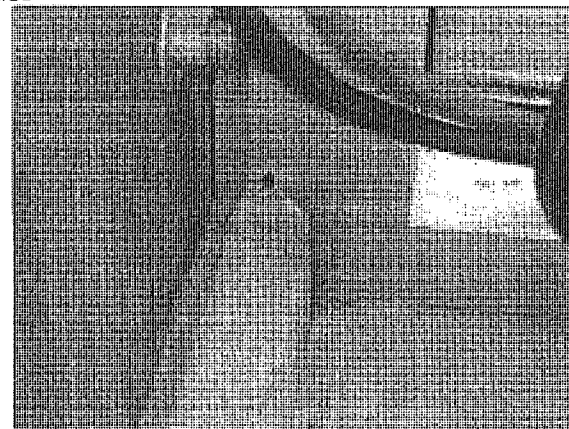
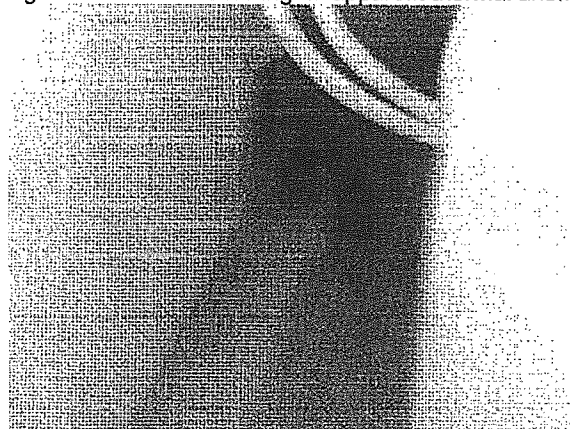


Figure 99. Infrared showing air leakage in corner

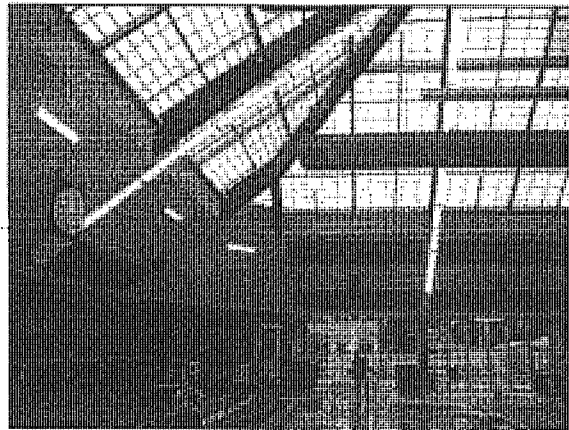
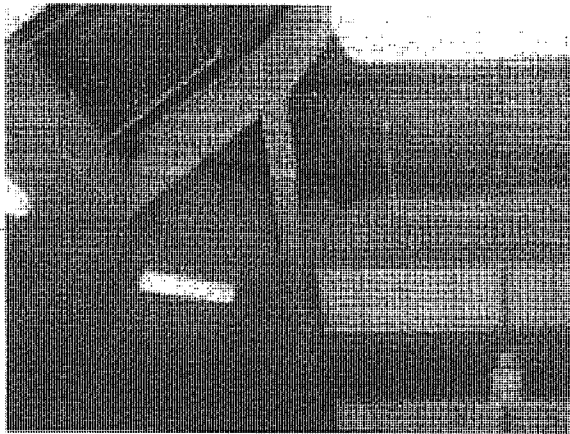


Figure 100. Infrared showing thermal bridging at translucent panel as well as moisture loading in wall below due to condensation from above

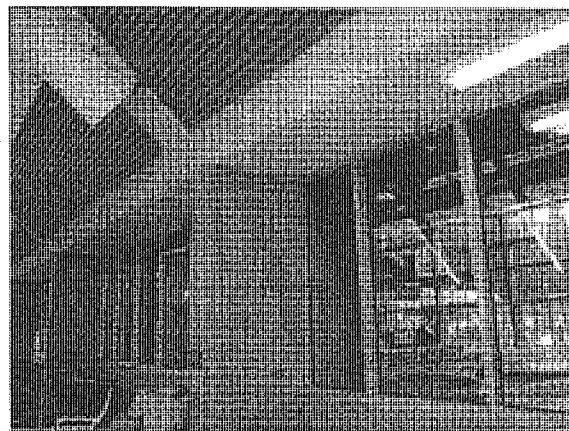
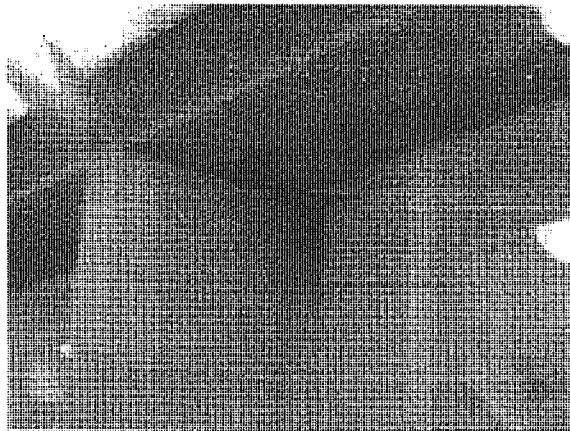


Figure 101. Infrared showing air leakage at column to ceiling/wall transition

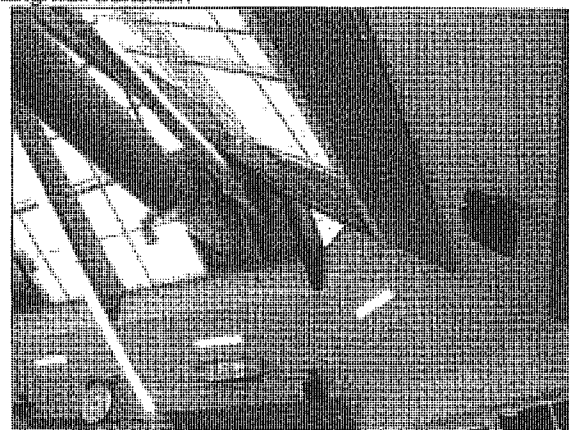
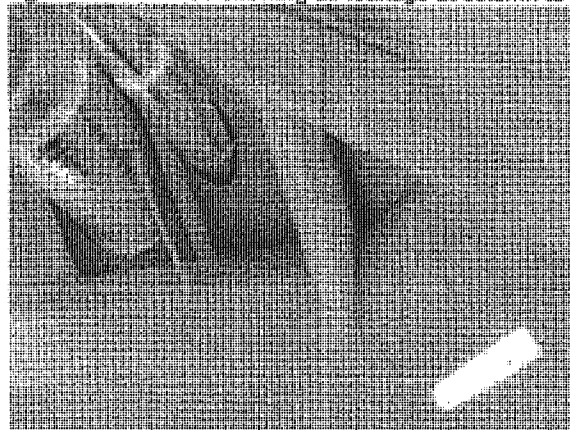


Figure 102. Infrared image showing thermal bridging



Figure 103. Infrared image showing thermal bridging

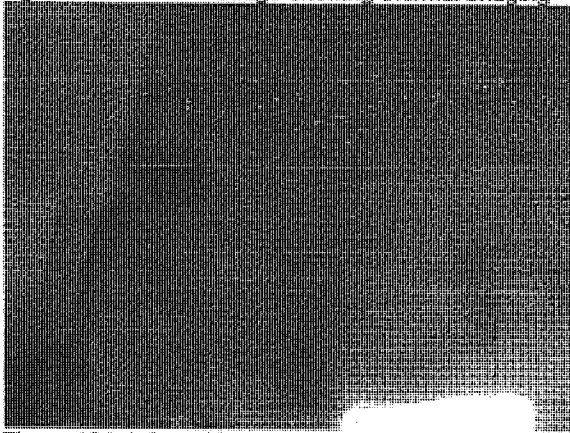
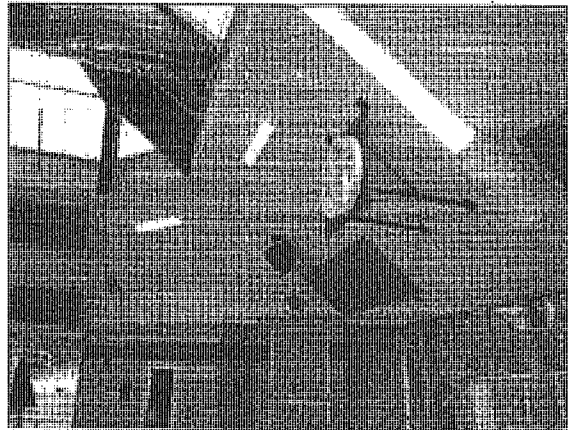


Figure 104. Infrared image showing no apparent thermal anomalies

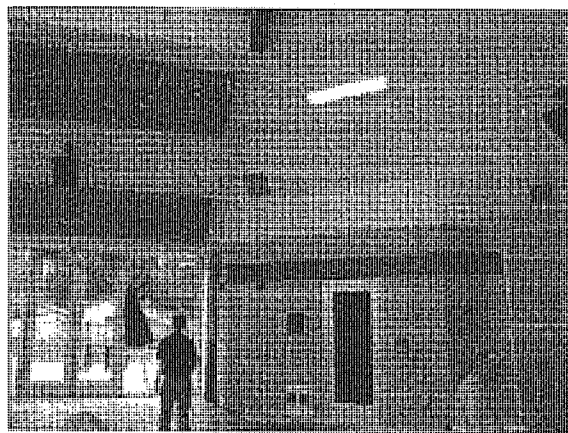
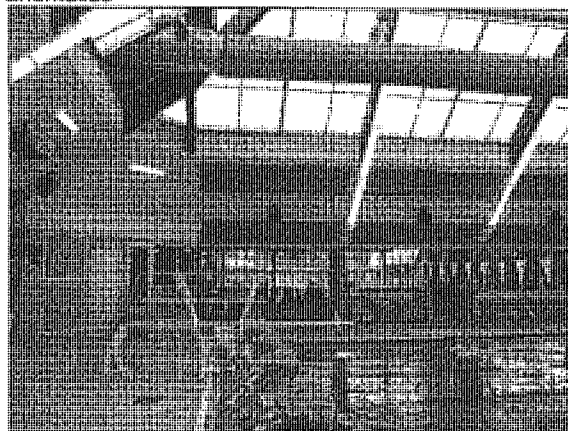


Figure 105. Infrared image showing no apparent thermal anomalies



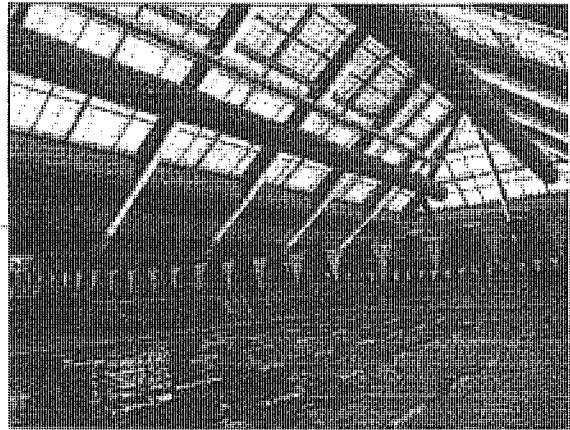
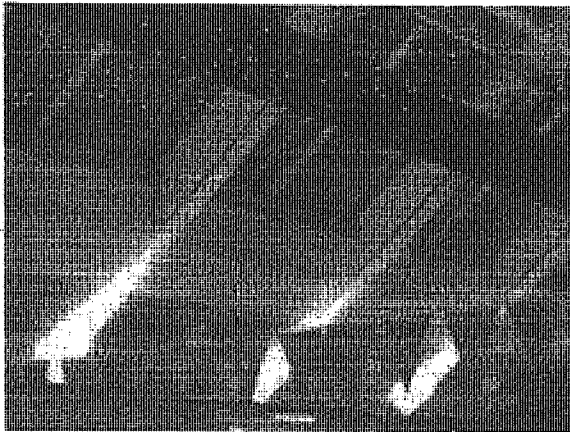


Figure 106. Infrared image showing no apparent thermal anomalies

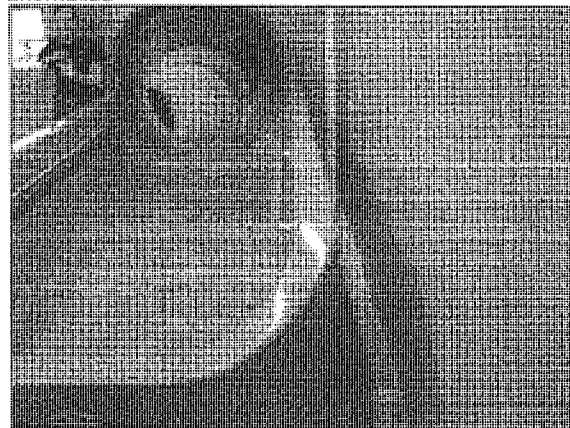


Figure 107. Infrared image showing thermal bridging in slide loading area

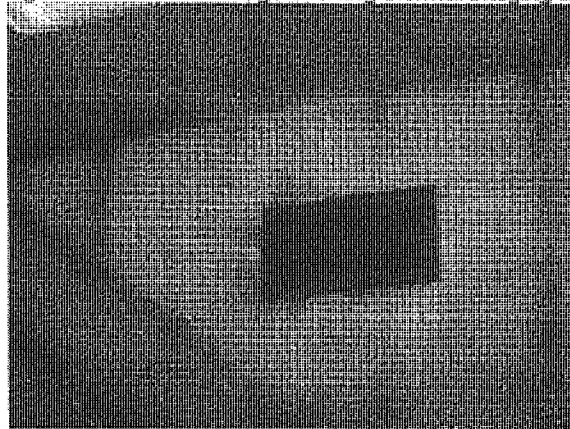


Figure 108. Infrared images showing thermal bridging and air leakage around vent in slide loading area

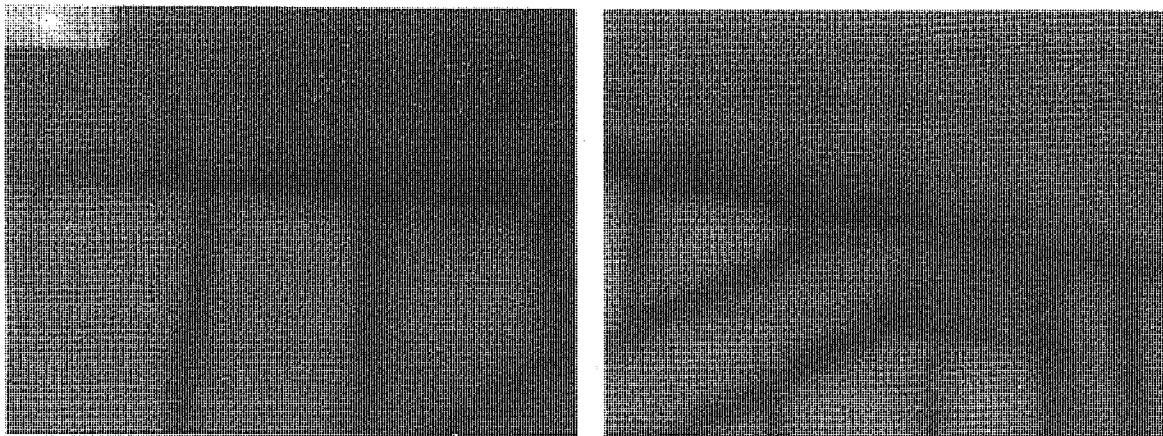


Figure 109. Infrared images showing thermal bridging and air leakage in wall in slide loading area

## Discussion

The inspection of the interaction between the natatorium spaces and the surrounding building has concluded that repairs to the mechanical systems and addition of exhaust vents have reversed the pressure in the natatoriums. It is apparent that the natatoriums were previously operating at a positive pressure but little to no damage was observed in surrounding areas of the building as would have been expected if the building had continued to operate as it had for the last year. Despite the lack of observable damage, there are areas such as the wall to rafter connections that were inaccessible during the inspection and further invasive investigation is advised in a representative sampling to verify conditions. Air leakage through the natatorium walls and roof is extensive, which reduces energy efficiency of the mechanical and climate systems but given the negative pressure in the natatoriums no additional damage or degradation is expected to result. However, it is likely that some damage exists to materials in the walls that should be investigated to determine severity.

Despite the lack of damage found in the walls, it may be advisable to open a section of the corrugated metal wall paneling on the roof in an area where evidence of internal corrosion can be seen to verify that the internal wall components have not been compromised. Additionally, a section of brick wall should be removed from the exterior to assess possible damage to the brick ties.

Climatic data collection showed that the natatorium spaces are operating at similar temperatures with relative humidity levels in an acceptable range. It is understood that this was not the case prior to repair and additions to the mechanical systems.

The extensive moisture damage to the wall in the boiler room has several possible causes that were not fully investigated due to the limited scope of work. Work performed


by maintenance staff after the initial site visit may solve the issue by blocking water from the slide loading area. Damaged materials in the boiler room should be removed, replaced and observed to determine if the problem has been solved. If moisture continues to accumulate, investigation into other possible sources should be conducted. The leak observed in the staff training room appears to be the result of either a plumbing leak from the fire sprinkler pipe or the same moisture causing damage in the boiler room above. At the time of BCRA's second site visit, the affected ceiling tile had been replaced but the new tile was wet and will likely fail like its predecessor. The fact that the new tile is wet suggests that the training room leak and the boiler room damage are either unrelated (suggesting a plumbing issue) or the sealant applied next to the slide was ineffective.

Several small locations on the East wall of the Beach natatorium appeared to be holding moisture in the stucco as revealed with the Infrared. These locations also appeared to have "slumped" from the moisture but BCRA was unable to confirm their condition at the time of initial inspection. A contractor removed material from those locations and installed a plastic joint at the bottom of the stucco wall and found no damaged or corroded building materials. As such, it appears that the areas in question were not harboring moisture and were not damaged.

An aerial infrared roof survey was not performed during this stage of the investigation. A limited infrared inspection as performed from the roof level and no evidence of trapped moisture in the roof insulation was observed. It should be noted that inspection from the level of the roof is not ideal and it is possible to miss areas of concern that would be clearly seen during an aerial survey. An aerial infrared survey would be effective on approximately half of the roof surface and is the best way to confirm that no moisture was pushed into the roof insulation during the year of operating the natatoriums under a positive pressure.

Lastly, Hygrothermal analysis of the as-built exterior enclosure was performed on multiple wall types and no issues were found. However, the modeling does not account for the extent of previous air leakage and the addition of chlorine to the hot, humid air passage through the enclosure. As such, the results are being interpreted as indicating an adequate assembly under current, normal operation and do not indicate that no damage was caused under previous conditions.

Jack Pearson, CBST



Building Science Specialist

## **ADDENDUM 1**

## OVERVIEW

Purpose Of Investigation – Based on the outcome of the Phase 1 investigation, including visual, infrared, and climatic conditions assessment, BCRA was asked to proceed with a more in-depth investigation to determine level of damages to building materials.

Scope - The issues noted in this report address actual and potential areas of degraded building materials and trapped moisture in the building. Recommendations are offered to assist the City of Lynwood in maintenance and repair of the building due to poorly performing mechanical systems and interactions between the natatorium spaces and the rest of the building.

Investigation Limitations - The methods used in the investigation site visit included visual inspection, infrared thermography, photographic documentation, and climatic data collection. Limited intrusive openings were made into the building from the exterior or interior. Any comments or recommendations are based on areas observed and discussions with the client or building occupants.

Pictorial Documentation - Photographs and IR Thermograms are included as Appendix B of this Report.

## FINDINGS

### Exterior Brick Veneer Wall

During the initial walk-thru and investigation stage, BCRA observed erratic behavior of the brick veneer wall system that exists along the North and West portions of the natatorium. Observations included efflorescence staining of the bricks as well as walls actively weeping despite the wall having not had an environmental load of water for many days prior. This irregular leakage is most likely due to condensation being formed as vapor laden air escapes the building envelope and goes through a temperature shift, finding its dew point. Often when natatoriums are involved the chemistry used to sanitize the pool releases chloramines into the air and if these chloramines are carried with the vapor laden air as it condenses; the chloramines and bulk water combine to form a highly corrosive solution. Knowing this, BCRA's first concern were the brick ties in the masonry system. To inspect the ties BCRA opened the brick in an area exhibiting the irregular weeping and was able to inspect multiple brick ties with a borescope. In the areas inspected, the brick ties showed no signs of abnormal corrosion. Additionally, the building wrap was dry to the touch even though weeping was occurring directly below the invasive opening. This brought BCRA to the conclusion that if/where condensation is occurring in the exterior wall system, it is within the framed cavity and not in the veneer drainage/air gap.

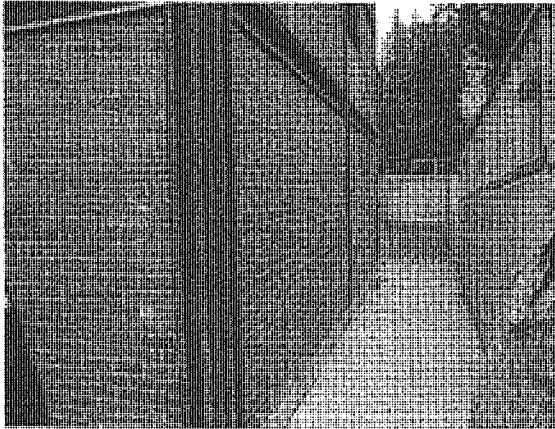


Figure 1. Efflorescence on exterior brick veneer wall

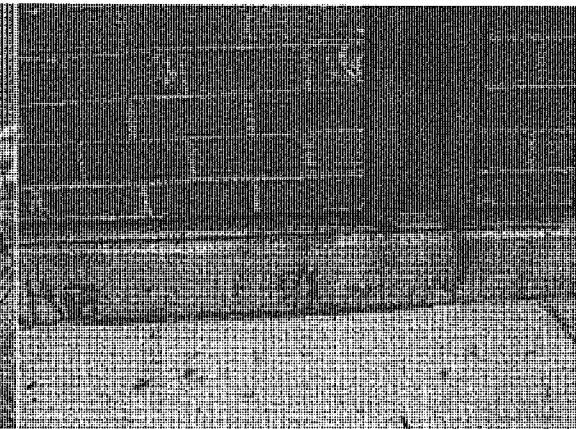


Figure 2. Moisture weeping from the base of the brick veneer system



Figure 3. Invasive opening created

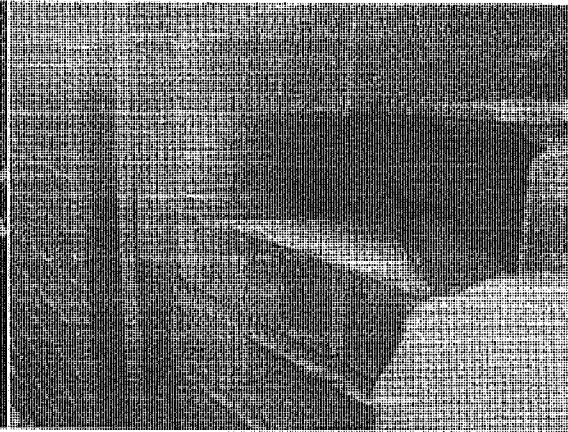


Figure 4. Brick cavity observed to be dry to the touch

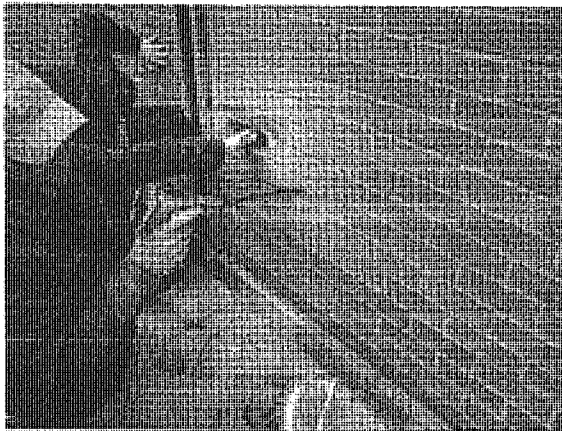


Figure 5. Borescope used to inspect cavity hardware

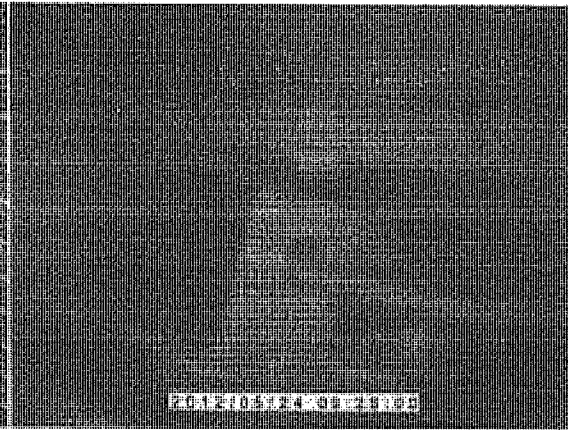


Figure 6. Inspected brick tie showing no corrosion



Figure 7. Inspected brick tie showing no corrosion

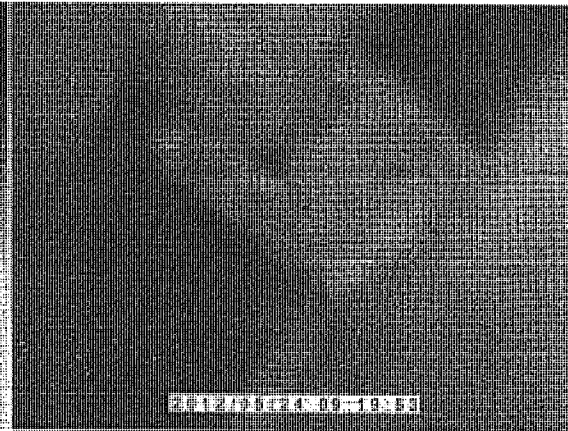


Figure 8. Inspected brick tie showing no corrosion

## Exterior Metal Panel Wall

During initial walk-thru and investigation stage BCRA observed the similar abnormal weeping stains at the base of the metal panel systems that run along the West wall of the natatorium, mainly at the walls spanning from low-sloped roof to wall. BCRA opened up multiple locations of metal paneling and found conditions similar to the brick veneer cavity. Although bulk water was weeping at the base of the system no moisture was noted on the exterior face of the weather barrier. The fasteners at these locations were noted to have corrosion on the portions that extend into the framed cavity suggesting moisture and possible chemical related corrosion occurring in the framed cavity. Additionally, the weather barrier was taped at some locations and not at others which would allow this material to act as a shingled water drainage plane but not as a continuous air barrier.

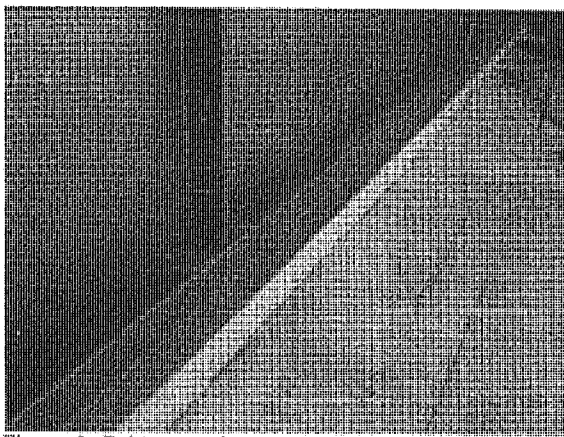


Figure 9. Evidence of past moisture weeping from the base of the metal panel system

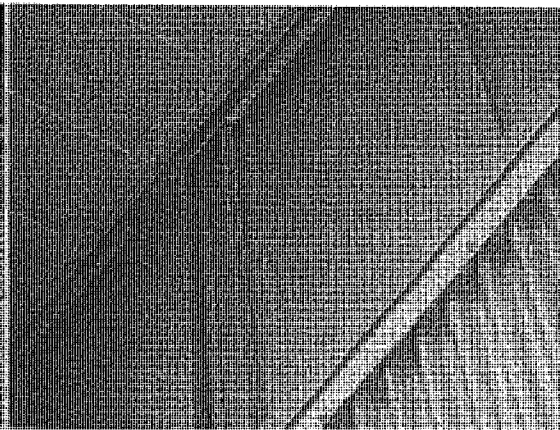


Figure 10. Evidence of past moisture weeping from the base of the metal panel system

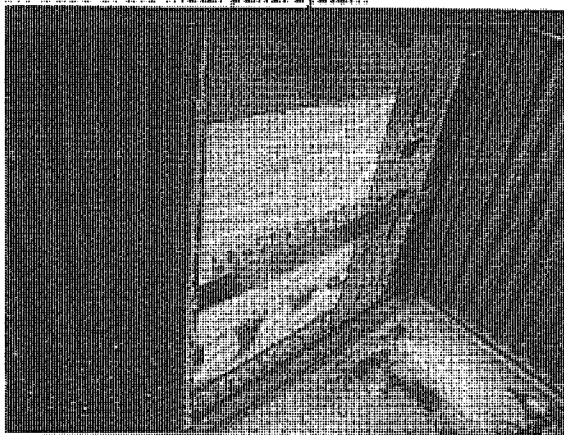


Figure 11. Weather barrier materials behind metal panel system

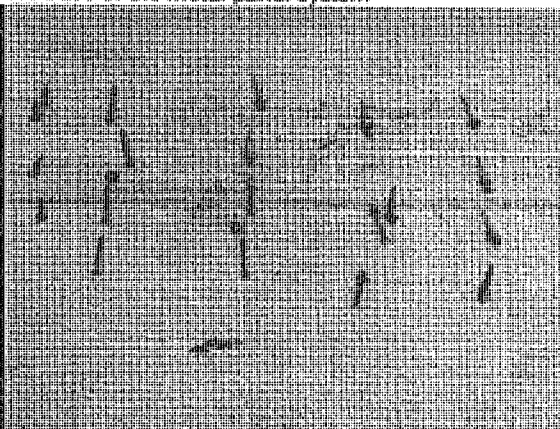


Figure 12. Removed fasteners exhibiting corrosion on threads which have been located in the framed cavity

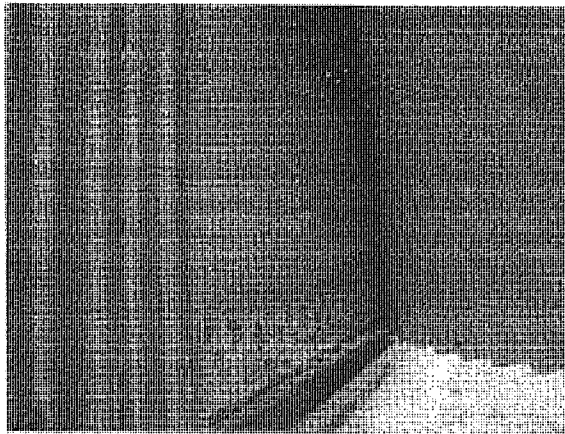


Figure 13. Panel rolled back to show weather barrier behind

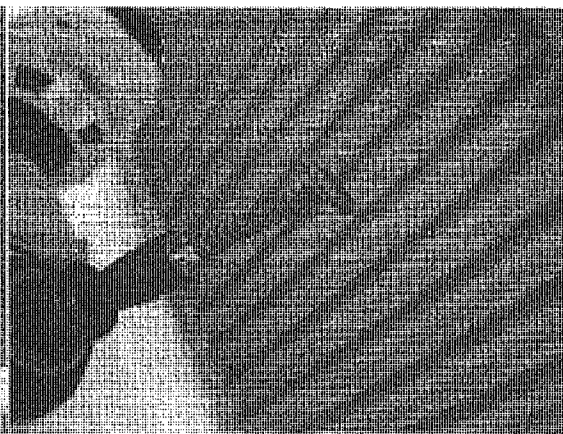


Figure 14. Corrosion on fastener threads

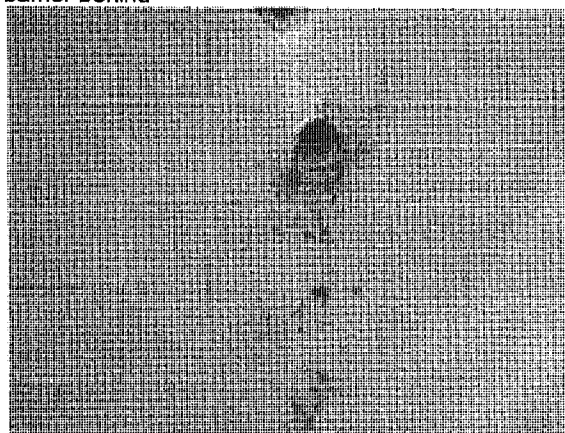


Figure 15. Corrosion at fastener penetration

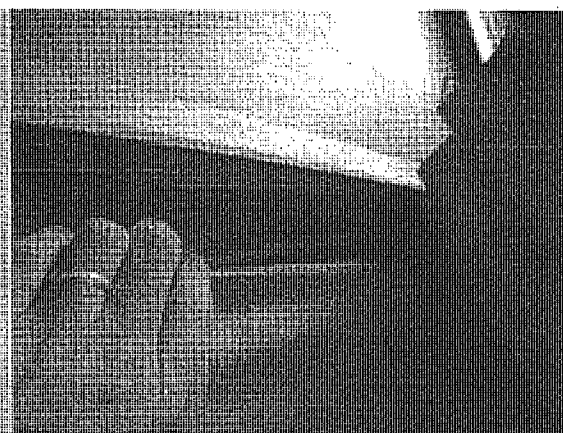


Figure 16. Weather barrier not acting as a continuous air barrier as seams are not taped in locations observed

### Framing Cavity Invasive Openings

Based on the evidence gained from the cladding systems inspection BCRA created multiple inspection openings to observe the conditions occurring within the framing cavity. These openings confirmed that the moisture load was and currently is being produced within the wall cavity. This is due to vapor laden air leakage over time caused by building pressurization and current complex air flow pathways within the framed cavity. In-wall condensation was present in all areas where openings were made. The highest load of in-wall condensation was found at areas where thermal bridges exist. Batt insulation materials ranged from completely saturated to moist to the touch. Minimal corrosion was noted in the framed wall. Corrosion was observed on fastener threads, cut ends of metal framing elements, and on heavy steel elements.

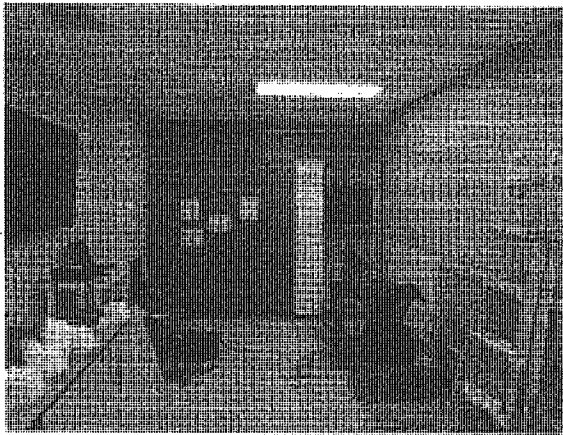


Figure 17. Training room- location of two invasive openings

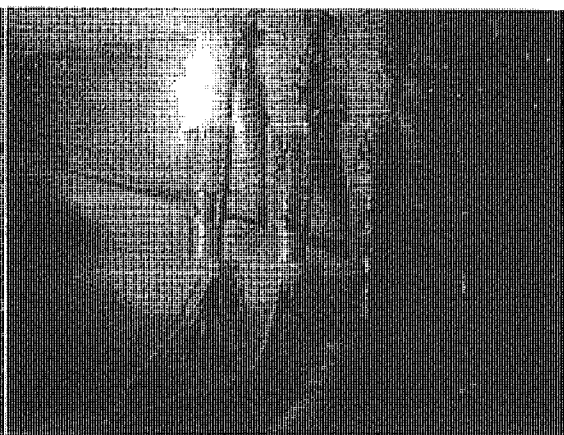


Figure 18. Above ceiling location showing slumped vapor barrier

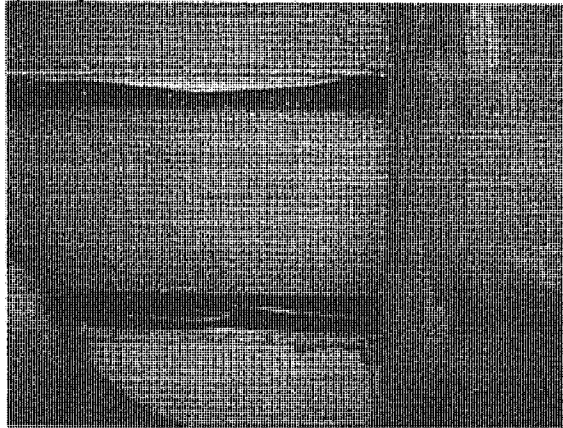


Figure 19. Condensation on the backside of a brick lintel – the thermal bridge exasperating the in wall problem

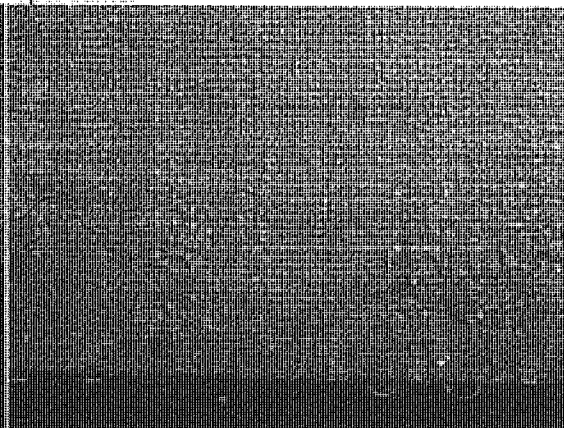


Figure 20. High level of condensation occurring on the interior side of the brick lintel

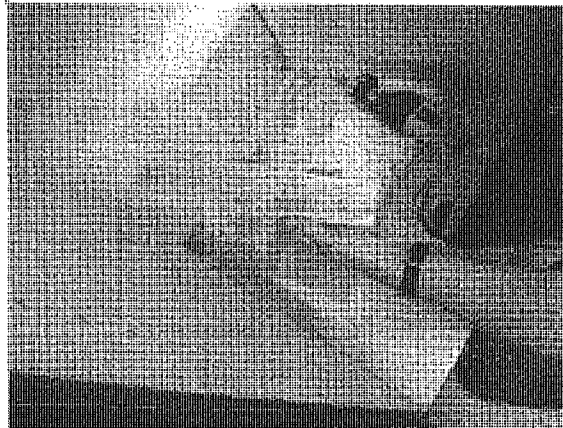


Figure 21. Microbial growth occurring on wood cabinetry that is tight against exterior wall

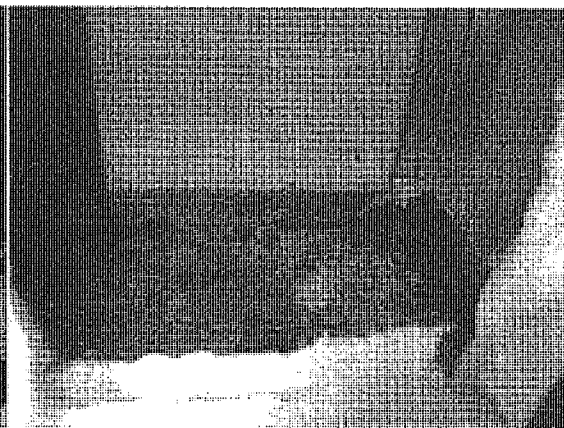


Figure 22. Interior of framed cavity showing 'wet' conditions and minor corrosion of framing elements



Figure 23. Saturated batt insulation and corrosion occurring on fasteners that penetrate into the framed cavity



Figure 24. Condensation occurring within the batt insulation

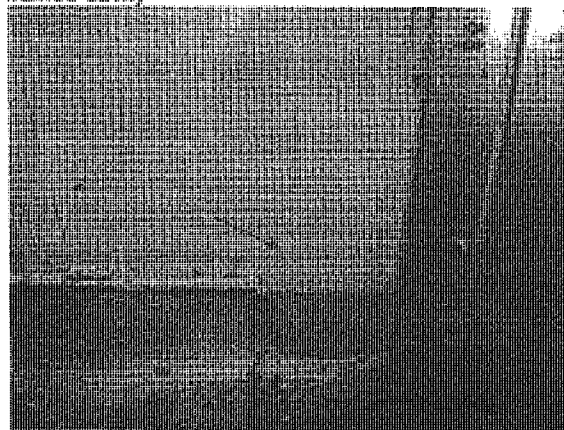


Figure 25. Vapor barrier located between gypsum wall board and framed cavity in place and showing possible condensation between gypsum and vapor barrier.

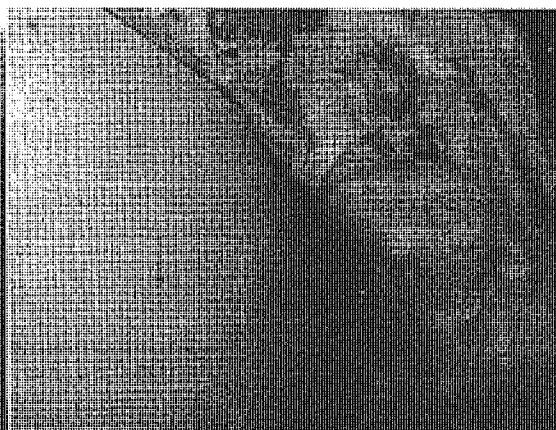


Figure 26. View looking up the framed cavity showing saturated insulation and corrosion on fasteners



Figure 27. Opening on second floor in boiler room



Figure 28. Insulation moist to the touch and evidence of moisture in framed cavity

## Low Sloped Roofing

BCRA was also asked to comment on the ponded water occurring at various locations on the single ply roofing membrane. The roofing was identified as a Firestone TPO product. BCRA was not involved in the specification or submittal process of the roof and does not know what, or if any warranties were associated with the warranties with this specific installation. However, the typical single ply roofing warranty offered by Firestone does not allow for water to collect on the surface for a period of longer than 48 hours following a rain event. Observed water on the single ply membrane systems at multiple locations would be in violation of this and possibly affect the warranty.

*"Proper maintenance and good roofing practice requires that ponded water (defined as standing water on the roof forty-eight (48) hours after it stops raining) not be allowed on the roof. Roofs should have slope to drain and all drain areas must remain clean. Bag and remove all debris from the roof since such debris can be quickly swept into drains by rain. This will allow for proper water run-off and avoid overloading the roof with ponded water."* – **Firestone Single Ply Roofing Membrane Limited Product Warranty.**

BCRA also reviewed the drawings pertaining to this issue. For the area over the racquetball courts where the largest area of ponded water is occurring the AOR called out for a single ply roofing membrane at a slope of  $1/8^{\text{th}}/1\text{ft}$ . As observed the current slope is not adequate to manage water as designed and constructed.

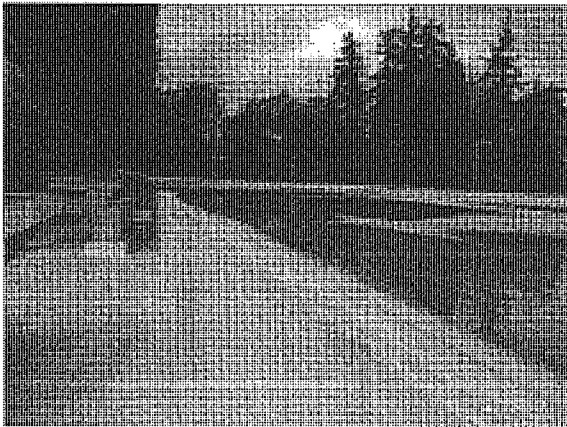


Figure 29. Area of ponded water over racquetball courts

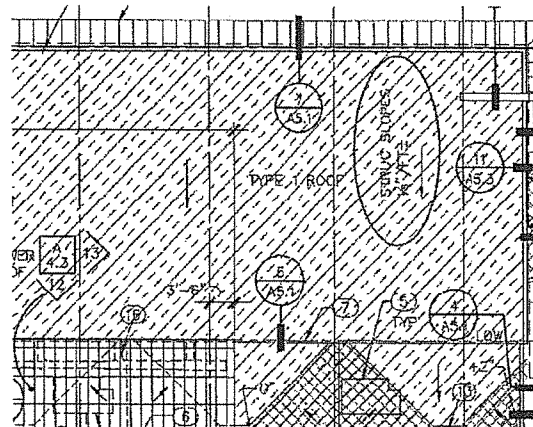


Figure 30. Call out of  $1/8^{\text{th}}/1\text{ft}$ . on drawings by AOR

## **Discussion**

BCRA has conducted multiple site investigations and found that the building has Three major issues that need to be addressed:

### **Chemical Induced Corrosion**

When BCRA was originally contacted regarding this investigation the issues of corrosion in the natatorium spaces had already been observed and lists of elements that were being impacted were shared with BCRA. This being the case the reason for the corrosion was not well understood. Simply put, the high levels of water vapor, or humidity in the air provided the mobile water for chloramines released by the pool to mix with creating a thin layer of a highly corrosive solution on metal surfaces. As witnessed certain metals reacted in this environment worse than others. Everything from handrails to the small metal electronic switches inside the desktop phones experienced corrosion. BCRA has created a matrix as Appendix A of this report that groups elements and materials together with recommended further actions for each. These elements are then prioritized based on level of severity of corrosion and importance. Newly provided fixtures, electronics, finishes, etc. are being negatively impacted. Additionally, fixtures, electronics, finishes that were in place prior to the renovation and have now been negatively impacted by the renovation. For example, the starting blocks on the lap pool have a stainless steel frame. Based on operator testimony, they have existed for years with only minor amounts of corrosion ever occurring on them. Once the renovation of the facility was complete, the starting blocks have experienced an accelerated corrosion and have required cleaning daily.

### **In Wall Condensation**

As evidenced by the invasive openings a serious problems exists with in-wall condensation. Although a vapor barrier is in the proper position to defend against vapor diffusion, vapor laden air is gaining access to areas in the wall system that allow a dew point to be reached. This can only be occurring due to air leakage. The infrared survey of the building walls and roof surrounding the natatorium showed multiple areas of air leakage. Additionally, the wall designed and constructed has not addressed thermal bridging of the framing and structural elements which brings cold surfaces further inward in the wall system and allowing for numerous locations with condensation potential.

This condition most likely existed in a much worse condition when the natatorium space was pressurized which mechanically forced vapor laden air through the building envelope. The natatorium space pressurization was realized to be an error and was corrected and is now running negative which will certainly improve the condition. However, as witnessed with the recent invasive investigation, complex air flow pathways still exist that brings vapor laden air in contact with materials in the framed cavity allowing for condensation.

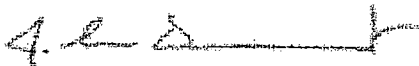
Knowing the current moisture load in the framed cavity and the fact that the current corrected operation of the natatorium HVAC system has not corrected in

whole the issue it is foreseen that this problem will be ongoing. Knowing this, it is BCRA's opinion that areas that separate the natatorium from the exterior should undergo a re-design and re-construction that takes into account barriers for Heat, Air, Moisture Liquid, and Moisture Vapor.

#### **Ponding on Low-Sloped Roofing**

Major issues of ponding exist on the newly constructed roof. An 1/8" slope was called out in the drawings and the manufacturer recommends a 1/4" slope minimum to provide drainage. Neither was met on the roof and large areas of ponded water exist. The worst of these occur over the racquetball court area. Even though the existing structure that the new roof was built on did not provide for the necessary slope, positive drainage could have been designed and constructed with tapered insulation ensuring a drained roof.

#### **Report Addendum By:**



J. Lee Durston  
Building Science Director

#### **Peer Review By:**



Dave Seifert  
Senior Building Science Specialist

**END OF REPORT**

2106 Pacific Avenue, Suite 300  
Tacoma, WA 98402  
T (253) 627-4367

 BCRA

## APPENDIX A

BCRADESIGN.COM



# BCRA Remediation Matrix

BCRA Project # 12110

Project Name: Lynnwood Recreation Center

Document Date: 6/11/2012

ITEM	DESCRIPTION	PRIORITY	RECOMMENDATION
1	Corrosion of window hardware	3	Remove and replace as needed
2	Corrosion of speaker mounting brackets and fasteners	1	Remove and replace as needed
3	Corrosion of door hardware	2	Remove and replace as needed
4	Damage to interior GWB in boiler room	4	Remove damaged materials and replace once source of leak is positively identified and corrected
5	Ponding on Roof	3	Use rigid roof insulation to achieve proper slope or have maintenance staff clear ponds as they form, check roof drains for clogging regularly
6	In-wall condensation	1	Redesign wall system to perform correctly, expose wall system and re-construct to achieve performance
7	Damage to building materials in walls	1	Remove and replace as needed
8	Evidence of microbial growth	1	Assess any discovered locations of growth, remove growth, treat area and replace materials as needed
9	Corrosion of wall plates, outlets, thermostats, switches, etc.	2	Remove and replace as needed

10	Moisture damage to wall materials and base of sloped translucent panel roof in lap natatorium	3	Remove and replace as needed	
11	Corrosion of handrails	2	Remove and replace as needed	
12	Corrosion of HVAC hangers, cables, fasteners	1	Remove and replace as needed	
13	Corrosion of structural fasteners	1	Remove and replace as needed	
14	Corrosion of stair fasteners and hardware	1	Remove and replace as needed	
15	Corrosion of chair fasteners	2	Remove and replace as needed	
16	Corrosion of sink, hardware, plumbing in staff training room	3	Remove and replace as needed	
17	Corrosion of fire sprinkler plumbing in natatorium	1	Remove and replace as needed	
18	Efflorescence on exterior brick	2	Remove buildup and clean areas as needed	
19	Corrosion of drinking fountains	4	Remove and replace as needed	
20	Corrosion of slide fasteners (slide tubes and structural mounting)	1	Remove and replace as needed	

21	Corrosion of phone system, audio system, electronics	2	Remove and replace as needed
22	Corrosion of mounting brackets for slide Stop/GO lights	3	Remove and replace as needed
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 BCRA

## APPENDIX B

BCRADESIGN.COM

**APPENDIX C: "Field Report," BCRA, August 17, 2013**

(Project Name)  
Field Report No.  
(Date)

## FIELD REPORT

PROJECT: Lynnwood

FIELD REPORT NO: 001

BCRA BUILDING ENVELOPE

PROJECT NO: R12110

DATE: 8/17/13

WEATHER: Overcast with some sun breaks

TIME: 9:45 AM

TEMPERATURE RANGE: 78 - 87 degrees F

PRESENT AT SITE: BCRA (Ken Rowan, Mike Nelson), Bill Haugen (City of Lynnwood)

## OBSERVATIONS

On 8/17/13, Mike Nelson and Ken Rowan from BCRA, AT THE REQUEST OF Bill Haugen of the city of Lynnwood, arrived at the Lynnwood pool in order to review discovered roof conditions with Bill Haugen, a roofing condition found at the tower location the previous day by a subcontractor who was preparing to install HVAC equipment mounting construction which required cutting open and removing in part a section of the TPO roofing, protection board and 1-1/2" rigid insulation. Upon removal of the roofing components, mold was found between the rigid insulation and the bottom of the protection board. The sample of roofing materials was viewed by BCRA and it was suggested to Mr. Haugen to have the mold sent out to a testing lab to verify species. Upon the initial removal of the rigid insulation it was found there was no vapor barrier installed over the concrete structural roof deck as was intended in the original construction documents. The rigid insulation was also wet with liquid water.

In June of 2012, it was determined and outlined in a previous report that the pool was in a neutral to positive pressure condition in which supplied air to the pool area was being delivered at a greater pressure than the surrounding zones, including the outside of the facility envelope. Remedial efforts were made to correct this condition and create the pool areas to have a negative pressure relative to the surrounding areas of the pool enclosure. Additionally, as an outgrowth of that report and study, the current HVAC upgrade project was developed and is now being executed.

At the time of the roof visit of 8/27/13, the clouds broke and the sun was upon the tower roof. There was minor evidence of water on the roof of the tower from the previous 24 hour rain fall. Unfortunately, due to the roof being exposed to solar heat gain during the time of the visit as well as having minor water on the surface of the roof, it was not possible to utilize infrared thermography to identify the possibilities of water within the roofing materials. The appropriate time for utilizing IR thermography would be after sunset and after the surface of the roofing began to drop in temperature. This temperature of the surface of the roof is affected differently where the substrate below the roofing (TPO) is either wet or dry and can be identified utilizing the IR camera. The areas where the insulation and perhaps the protection board are wet will be clearly seen and identified and can be mapped.

Temperature and humidity reading were taken this date for general spot check. T and H on the tower roof at 12:52 PM were 86.7 degrees F and 38 % RH. Directly below the tower roof, inside the tower at the water slide entry, the inside temperature was 84.7 degrees F and 70% RH.

(Project Name)  
Field Report No.  
(Date)

As noted previously, there is work being performed under a separate contract for upgrades to the HVAC system which included ductwork revisions on the main roof adjacent to the slide tower. The ductwork was scheduled to be removed on this date which would expose the lower roof for easier examination.

#### ACTION ITEMS/RECOMMENDATIONS

Understanding time is critical and the HVAC upgrade work is needing to continue, and in light of the discovery of the mold and water within the roofing composite and that there was no vapor barrier installed at the concrete structural deck, it is recommended that additional areas of the tower roof and the lower main roof be cut open, exposing the roofing composite materials for inspection for possible mold, water and vapor barrier. In order to identify the best location for exploratory openings of the roofing, which would most likely be within areas suspected to have water, an aerial infrared should be performed of the entire facility roof. In order to obtain the best IR data, the aerial infrared images would need to be performed at night after the facility roof had been warmed up during the day and the surface to the roofing was cooling due to the evenings outside air temperature drop. It is also necessary that the surface of the roof not be wet or have standing/ponding water. Due to the necessity of having the roof surface dry and as unobstructed as possible (by ductwork and standing/ponding water), it is recommended that the scheduling of the aerial infrared be at a time when the weather forecast does not predict rain and adequate time occur between the last rainfall to allow the surface to have become dry. It is suggested that in order to aid the drying of any standing/ponding water on the roof, that the standing/ponding water be removed by mechanical means (i.e. squeegee or wet vacuum).

If time does not allow for an aerial infrared study to identify best possible location of water within the roofing composite, random locations for opening of the roof could be identified and the roof then opened up for inspection. This random process may not give the best results in identifying the overall condition of the roofing composite materials and the possibilities of mold as previously found at the slide tower location. Schedule of the HVAC upgrade may dictate that this method be taken rather than waiting for proper climatic conditions to occur allowing for an aerial infrared to be performed.

Additionally, since moisture is evident within the roof composite, it is advisable to take a sample, either as free liquid or, if in saturated protection board or insulation, and have the liquid tested for its composition and whether it has chlorine (or Chloramine) or not. We have used Spectra Laboratories (2221 Ross Way, Tacoma, WA 98421) in the last chlorine (chloramines) test for a recent project. There are other testing groups that you could perform such testing as well. Samples need to be precisely taken and packaged so as not to expose to light. The testing agency can assist in direction on the sampling and handling of any samples. If it is found that chlorine (Chloramines) exist in the liquid water, it would be advisable to check to see if any of the slab reinforcing (ferrous metal) has been compromised. The best way to check the reinforcing is to locate the reinforcing and chipping out concrete until the reinforcing is exposed. The concrete deck at the slide tower is a steel pan system with concrete poured over the steel deck. The steel decking, depending on the slab edge condition and what penetrations, if any, occur, is a good vapor barrier. Further investigation of the edge condition and possible penetrations would be necessary in the effort to find any possible route of vapor traveled in air to the underside of the TPO roofing.

As mentioned above, with the understanding that time is critical to the HVAC upgrade project, it may be a consideration to continue with the HVAC upgrade work and on a separate track, perform some or all of the above listed items of investigation, and if necessary, perform any re-roofing and VB/insulation

(Project Name)  
Field Report No.  
(Date)

measures in the near future, perhaps this coming year. This approach would allow the HVAC upgrades to be complete and brought on line, thereby not having any delays or facility closures due to the moisture/mold found in the roofing system.

BCRA is available to assist in performing the testing and samplings as described above as the City of Lynnwood deem necessary and advisable. Please let us know if or how you would want BCRA to assist in your needs and we can schedule accordingly. If you have any question, please contact me. I can be reached either at the office (253-627-4367) or by cell (253-606-8380).

Thank you for contacting us and having BCRA visit the site and for considering the views we have outlined above. We look forward to possibly working with the City of Lynnwood in the future as your needs arise.

PREPARED BY: Ken Rowan

END OF FIELD REPORT

Attachments: None

cc: Todd Wolf, BCRA building Envelope Director

RED SHIELD



WARRANTY

## RED SHIELD ROOFING SYSTEM LIMITED WARRANTY

Warranty No: RP100554 FBPCO # DB6099 Square Footage: 26000 s.f.  
 Building Owner: LYNNWOOD RECREATION CENTER  
 Building Identification: LYNNWOOD RECREATION CENTER  
 Building Address: 18900 44TH AVE. W., LYNNWOOD, WA, 98038  
 Warranty Period Of: FIFTEEN (15) Years; Beginning On: 12/17/10  
 Roofing Contractor: SQI INC. (08846)

For the warranty period indicated above, Firestone Building Products Company, LLC ("Firestone"), an Indiana limited liability company, warrants to the Building Owner ("Owner") named above that Firestone will, subject to the Terms, Conditions and Limitations set forth below, repair any leak in the Firestone Roofing System ("System").

## TERMS, CONDITIONS AND LIMITATIONS

- Products Covered.** The System shall mean only the Firestone brand roofing membranes, Firestone brand roofing insulations, Firestone brand roofing metal, and other Firestone brand roofing accessories which installed in accordance with Firestone technical specifications by a Firestone-licensed applicator.
- Notice.** In the event any leak should occur in the System, the Owner must give notice in writing or by telephone to Firestone within thirty (30) days of any occurrence of a leak. Written notice may be sent to Firestone at the street address or fax number shown on the reverse side of this Limited Warranty. Evidence of this notice shall be the receipt by Owner of a Firestone Leak Notification Acknowledgement. By so notifying Firestone, the Owner authorizes Firestone or its designee to investigate the cause of the leak.
- Investigation.** If upon investigation, Firestone determines that the leak is not excluded under the Terms, Conditions and Limitations set forth in this Red Shield Roofing System Limited Warranty (the "Limited Warranty"), the Owner's sole and exclusive remedy and Firestone's total liability shall be limited to the repair of the leak. Should the investigation reveal that the leak is excluded under the Terms, Conditions and Limitations, the Owner shall be responsible for payment of the investigation costs. Failure by Owner to pay for these costs shall render this Limited Warranty null and void. Firestone will advise the Owner of the type and/or extent of repairs required to be made at the Owner's expense that will permit this Limited Warranty to remain in effect for the unexpired portion of its term. Failure by the Owner to properly make these repairs in a reasonable manner using a Firestone-licensed applicator and within 60 days shall render this Limited Warranty null and void.
- Disputes.** Any dispute, controversy or claim between the Owner and Firestone concerning this Limited Warranty shall be settled by mediation. In the event that the Owner and Firestone do not resolve the dispute, controversy or claim in mediation, the Owner and Firestone agree that neither party will commence or prosecute any suit, proceeding, or claim other than in the courts of Hamilton County in the state of Indiana or the United States District Court, Southern District of Indiana, Indianapolis Division. Each party irrevocably consents to the jurisdiction and venue of the above-identified courts.
- Payment Required.** Firestone shall have no obligation under this Limited Warranty unless and until Firestone and the licensed applicator have been paid in full for all materials, supplies, services, approved written change orders, warranty costs and other costs which are included in, or incidental to, the System. In the event that repairs not covered by this Limited Warranty are necessary in the future, Firestone reserves the right to suspend this Limited Warranty until such repairs have been completed and the licensed applicator and/or Firestone has been paid in full for such repairs.  
**Exclusions:** Firestone shall have no obligation under this Limited Warranty, or any other liability, now or in the future if a leak or damage is caused by: (a) Natural forces, disasters, or acts of God including, but not limited to winds in excess of 55MPH, fires, hurricanes, tornadoes, hail, wind-blown debris, lightning, earthquakes, volcanic activity, atomic radiation, insects or animals; (b) Any act(s), conduct or omission(s) by any person, or act(s) of war, terrorism or vandalism, which damage the System or which impair the System's ability to resist leaks; (c) Failure by the Owner to use reasonable care in maintaining the System, said maintenance to include, but not limited to those items listed on the reverse side of this Limited Warranty titled "Building Envelope Care and Maintenance Guide"; (d) Deterioration or failure of building components, including, but not limited to, the roof substrate, walls, mortar, HVAC units, etc.; (e) Condensation or infiltration in, through, or around the walls, copings, rooftop hardware or equipment, building structure or underlying or surrounding materials; (f) Any acid, oil, harmful chemical, chemical or physical reaction and the like which comes in contact with the System, which damages the System, or which impairs the System's ability to resist leaks; (g) Alterations or repairs to the System that are not completed in accordance with our published specifications, not completed by licensed contractor, and/or where current obligation procedures were not followed; (h) The architecture, engineering, construction, or design of the roof, roofing system, or building. Firestone does not undertake any analysis of the architecture or engineering required to evaluate what type of roof system is appropriate; (i) A change in building use or purpose; (j) Deterioration to metal roofing materials and accessories caused by marine salt water atmosphere or by regular spray of either salt or fresh water; or (k) Failure to give proper notice as set forth in paragraph 2(a) above.
- Transfer.** This Limited Warranty shall be transferable subject to Owner's payment of the current transfer fee set by Firestone.
- Term.** The term of this Limited Warranty shall be for the period set forth above and such term shall not be extended under any circumstances.
- Roof Access.** During the term of this Limited Warranty, Firestone's designated representative or employees shall have free access to the roof during regular business hours. In the event that roof access is limited due to security or other restrictions, Owner shall reimburse Firestone for all reasonable cost incurred during inspection and/or repair of the System that are due to delays associated with said restrictions. Owner shall be responsible for the damage caused by, removal and replacement of any overburdens, substrates or overlays, either permanent or temporary, excluding accepted stone ballast or pavers, as necessary to expose the system for inspection and/or repair.
- Waiver.** Firestone's failure to enforce any of the terms or conditions stated herein shall not be construed as a waiver of such provision or of any other terms and conditions of this Limited Warranty.
- Governing Law.** This Limited Warranty shall be governed by and construed in accordance with the laws of the State of Indiana without regard to that State's rules on conflict of laws.
- Severability.** If any portion of this Limited Warranty is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remaining provisions shall nevertheless continue in full force.

FIRESTONE DOES NOT WARRANT PRODUCTS INCORPORATED OR UTILIZED IN THIS INSTALLATION THAT WERE NOT FURNISHED BY FIRESTONE. FIRESTONE SPECIFICALLY DISCLAIMS LIABILITY UNDER ANY THEORY OF LAW ARISING OUT OF THE INSTALLATION OF, PERFORMANCE OF, OR DAMAGES SUSTAINED BY OR CAUSED BY, PRODUCTS NOT FURNISHED BY FIRESTONE.

THIS LIMITED WARRANTY SUPERSEDES AND IS IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND FIRESTONE HEREBY DISCLAIMS ALL SUCH WARRANTIES. THIS LIMITED WARRANTY SHALL BE THE OWNER'S SOLE AND EXCLUSIVE REMEDY AGAINST FIRESTONE, AND FIRESTONE SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL OR OTHER DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR DAMAGES TO THE BUILDING OR ITS CONTENTS OR THE ROOF DECK. THIS LIMITED WARRANTY CANNOT BE AMENDED, ALTERED OR MODIFIED IN ANY WAY EXCEPT IN WRITING SIGNED BY AN AUTHORIZED OFFICER OF FIRESTONE. NO OTHER PERSON HAS ANY AUTHORITY TO BIND FIRESTONE WITH ANY REPRESENTATION OR WARRANTY WHETHER ORAL OR WRITTEN.

FIRESTONE BUILDING PRODUCTS COMPANY, LLC

By: Phil LaDuke

Authorized  
Signature:

Title: Director, Quality Assurance

Firestone

046907

**BUILDING ENVELOPE CARE AND MAINTENANCE GUIDE  
(For Red Shield Warranted Roofing Systems)**

Congratulations on your purchase of a Firestone Roofing System! Your roof is a valuable asset that should be properly maintained. All roofs and roofing systems require periodic inspection and maintenance to perform as designed and to keep your Limited Warranty in full force and effect.

1. The roof should be inspected at least twice yearly and after any severe storms. A record of all inspection and maintenance activities should be maintained, including a listing of the date and time of each activity as well as the identification of the parties performing the activity.
2. Proper maintenance and good roofing practice require that ponded water (defined as water standing on the roof forty-eight hours after it stops raining) not be allowed on the roof. Roofs should have slope to drain, and all drain areas must remain clean. Bag and remove all debris from the roof since such debris can be quickly swept into drains by rain. This will allow for proper water run-off and avoid overloading the roof.
3. The Firestone Roofing System should not be exposed to acids, solvents, greases, oil, fats, chemicals and the like. If the Firestone Roofing System is in contact with any such materials, these contaminants should be removed immediately and any damaged areas should be inspected by a Firestone Licensed Applicator and repaired if necessary.
4. The Firestone Roofing System is designed to be a waterproofing membrane and not a traffic surface. Roof traffic other than periodic traffic to maintain rooftop equipment and conduct periodic inspections should be prohibited. In any areas where periodic roof traffic may be required to service rooftop equipment or to facilitate inspection of the roof, protective walkways should be installed by a Firestone Licensed Applicator as needed to protect the roof surface from damage.
5. Some Firestone roofing membranes require maintenance of the surface of the membrane:
  - a. Smooth-surfaced Firestone APP membranes should be coated with an approved liquid coating, such as Firestone Aluminum Roof Coating or Firestone AcryliTop applied in accordance with Firestone specifications. In order to maximize the service life of the membrane. If this coating is not applied as part of the initial roofing installation, it should be applied within the first five years after the roof is installed to help protect the membrane from surface crazing and cracking. In addition, this coating should be maintained as needed to re-coat any areas that have blistered, peeled or worn through.
  - b. Granule-surfaced Firestone APP and SBS membranes do not normally require surface maintenance other than periodic inspection for contaminants, cuts or punctures. If areas of granular loss are discovered during inspection, these areas should be coated with Firestone AcryliTop or other Firestone-approved coating applied in accordance with Firestone specifications.
  - c. Gravel-surfaced Firestone BUR membranes do not normally require surface maintenance other than periodic inspection for contaminants or damage. If areas of gravel loss are discovered during inspection, gravel must be reinstalled into hot asphalt to protect the surface of the membrane. Coatings on smooth surface BUR membranes must be maintained as needed to re-coat any areas that have blistered, peeled or worn through.
  - d. Firestone EPDM and TPO roofing membranes do not normally require surface maintenance other than periodic inspection for contaminants, cuts or punctures. Occasionally, approved liquid roof coatings, such as Firestone AcryliTop, are applied to the surface of EPDM membranes in order to provide a lighter surface color. Such coatings do not need to be maintained to assure the performance of the underlying EPDM roof membrane, but some maintenance and re-coating may be necessary in order to maintain a uniform surface appearance.
  - e. Firestone Una-Clad metal roofing panels and trim do not normally require surface maintenance other than periodic inspection for contaminants or damage. In addition, periodic cleaning of the surface may be required to remove dirt and maintain the aesthetic appearance of the coated metal. Simple washing with plain water using hoses or pressure spray equipment is usually adequate. If cleaning with agents other than water is contemplated, several precautions should be observed: (1) do not use wire brushes, abrasives, or similar cleaning tools which will mechanically abrade the coating surface, and (2) cleaning agents should be tested in an inconspicuous area before use on a large scale.
6. All metal work, including counter-flashings, drains, skylights, equipment curbs and supports, and other Firestone brand rooftop accessories must be properly maintained at all times. Particular attention should be paid to sealants at joints in metal work and flashings. If cracking or shrinkage is observed, the joint sealant should be removed and replaced with new sealant.
7. Any alterations to the roof, including but not limited to roof curbs, pipe penetrations, roof-mounted accessories, and tie-ins to building additions must be performed by a licensed Firestone Licensed Applicator and reported to Firestone. Additional information and reporting forms for roof alterations are available at [www.firestonebpc.com](http://www.firestonebpc.com).
8. Should you experience a leak:
  - (a) Check for the obvious: clogged roof drains, loose counterflashings, broken skylights, open grills or vents, broken water pipes.
  - (b) Note conditions resulting in leakage. Heavy or light rain, wind direction, temperature and time of day that the leak occurs are all important clues to tracing roof leaks. Note whether the leak stops shortly after each rain or continues to drip until the roof is dry. If you are prepared with the facts, the diagnosis and repair of the leak can proceed more rapidly.
  - (c) Contact Firestone Warranty Claims at 1-800-830-5612 as soon as possible...but please don't call until you are reasonably sure that the Firestone Roofing System is the cause of the leak.

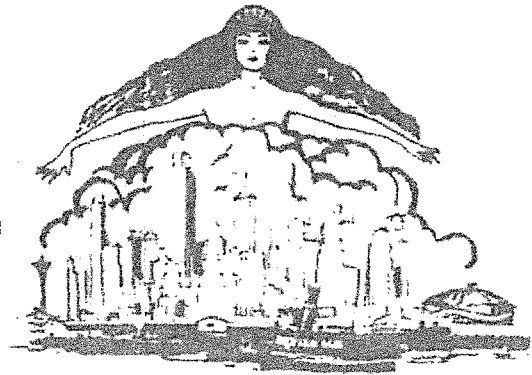
Firestone feels that the preceding requirements will assist you, the building owner, in maintaining a watertight roof for many years. Your roof is an investment, and maintenance is essential to maximize your return on this important investment.

**Firestone**  
**BUILDING PRODUCTS**  
**NOBODY COVERS YOU BETTER™**  
250 West 96th Street – Indianapolis, IN 46260  
1-800-428-4442 \* 1-317-575-7000 \* FAX 1-317-575-7100  
[www.firestonebp.com](http://www.firestonebp.com)

**APPENDIX D: “Existing Roof Condition,” Queen City Sheet Metal & Roofing, Inc. August 26, 2013**

*Queen City Sheet Metal & Roofing, Inc.*

22030 84th AVE. S., KENT, WA 98032 • (206) 623-6020 • FAX (206) 292-9708



August 26, 2013

Holmberg Co.  
Attn: Mr. Dana Hannan  
Project: Lynnwood Rec. Center  
RE: Existing Roof Condition

Dear Mr. Hannan,

We started our work today at The Lynnwood Recreation Center and were surprised to find there is no existing vapor barrier over the concrete roof deck. We took several core cuts on the lower roof and the upper roof and found the same conditions on both roof decks. Without the vapor barrier; moisture has passed thru the concrete slab and was trapped under the TPO membrane roof. The trapped moisture has destroyed the existing cover board material, soaked the existing insulation, un-bonded the TPO membrane from the cover board and has allowed black mold to grow within the roofing system.

Please forward this information on to The City of Lynnwood. We believe this to be a very serious problem and the entire facility should be re-roofed before further damage is done. We understand the existing roofing system is still under warranty from Firestone. We suggest informing Firestone of this problem immediately and contacting a roof consultant such as Wetherholt to assess the situation.

Thank you,

A handwritten signature in black ink, appearing to read 'Mark Puetz', written over a horizontal line.

Mark Puetz – Project Manager

**APPENDIX E: Documents Downloaded From Lynnwood FTP Site, October 22, 2013**

## 00 Submittals

### 00 Incoming

(Empty)

### 01 Outgoing

#### 07 21 00-001 - Reviewed

07 21 00 Mineral Fiber Building Insulation

#### 07 54 20 - Reviewed

07 54 20 Thermoplastic Membrane Roofing

#### 08 11 00- Reviewed

08 11 00 Steel Doors and Frames

#### 08 71 00 - Reviewed

08 71 00 Finish Hardware

Best Cylinder

#### 09 90 00-001 - Reviewed

09 90 00 Painting

#### 21 31 13-002 - Reviewed

23 31 13 Metal Ducts and Casings R

23 31 13 Submittal Review

#### 23 00 00-001 - Reviewed

23 00 00 Submittal Review

#### 23 05 19-001 - Reviewed

23 05 19 Meters and Gages for HVAC Piping

230509 Submittal

#### 23 05 23-001 - Reviewed

23 05 23 General-Duty Valves for HVAC Piping

230523 Submittal

#### 23 05 33-001 - Reviewed

23 05 33 Heat Tracing for HVAC Piping

230533 Submittal

#### 23 05 48-001 - Reviewed

23 05 48 Vibration and Sesimic Controls for Mechanical Systems

230548 Submittal

#### 23 07 19-001 - Reviewed

23 07 19 HVAC Piping and Equipment Insulation

230719 Submittal

#### 23 07 19-002 - Reviewed

230719 Submittal 002

#### 23 09 13 & 23 09 23

23 09 13 & 23 09 23

230913 230923 Submittal

Lynnwood Recreation Center - Natatorium HVAC Replacement - Siemens Submittal

#### 23 21 13-001 - Reviewed

23 21 13 Hydronic Piping

232113 Submittal

#### 23 21 23-001 - Reviewed

23 21 23 Hydronic Pumps

- 232123 Submittal
- 23 31 13-001 - Reviewed*
  - 23 31 13 Metal Ducts and Casings
  - 23 31 13 Submittal
- 23 31 13-002 - Reviewed*
  - 23 31 13 Metal Ducts and Casings
  - 23 31 13 Submittal Review
- 23 33 00-001 Reviewed*
  - 23 33 00 Air Duct Accessories
  - 233300 Submittal
- 23 64 26-001 - Reviewed*
  - 23 64 26 Centrifugal or Rotary-Screw Water Chillers
  - 236426 Submittal
- 23 81 01-001 - Reviewed*
  - 23 81 01 Terminal Heat Transfer Units
  - 238101 Submittal
- 23 3300 Exhaust Fan Resubmit*
  - Alternate 1 Exhaust Fan
  - Exhaust Fan Review
- 232113 - r1*
  - 232113 Submittal
  - flexible Coupling Submittal
- Div 23, Trane Package (Chiller) - Reviewed*
  - Chiller Presubmittal
  - Chiller, Reviewed
- Sensor Smoke Detector - Reviewed*
  - System Sensor Smoke Detector Submittal
  - System Sensor Smoke Detector
- 06 16 00 Sheathing
- 07 41 00 & 07 62 00 Reviewed
- 07 54 20 Thermoplastic Membrane Roofing 2
- 08 11 00 Steel Doors and Frames
- 26 05 19 Low Voltage Electrical Power Conduits and Cables - Cross Review 9-3-13
- 26 05 33 Raceway and Boxes for Electrical Systems - Cross Review 9-3-13
- 26 27 26 Wiring Devices - Cross Review 9-3-13
- 26 28 16 Enclosed Switches and Circuit Breakers - Cross Review 9-23-13
- Ladder Cage Drawing A501
- Submittal Log
- 02 Original*
  - 06 16 00 Sheathing
  - 07 21 00 Mineral Fiber Building Insulation
  - 07 41 00 & 07 62 00
  - 07 54 20 Thermoplastic Membrane Roofing
  - 08 11 00 Steel Doors and Frames R
  - 08 11 00 Steel Doors and Frames
  - 08 71 00 Finish Hardware
  - 09 90 00 Painting
  - 23 05 19 Meters and Gages for HVAC Piping

- 23 05 23 General-Duty Valves for HVAC Piping
- 23 05 33 Heat Tracing for HVAC Piping
- 23 05 48 Vibration and Seismic Controls for Mechanical Systems
- 23 07 19 HVAC Piping and Equipment Insulation
- 23 09 13 & 23 09 23
- 23 21 13 Hydronic Piping
- 23 21 23 Hydronic Pumps
- 23 31 13 Metal Ducts and Casings
- 23 33 00 Air Duct Accessories
- 23 64 26 Centrifugal or Rotary-Screw Water Chillers
- 23 81 01 Terminal Heat Transfer Units
- 26 05 19 Low Voltage Electrical Power Conduits and Cables
- 26 05 33 Raceway and Boxes for Electrical Systems
- 26 27 26 Wiring Devices
- 26 28 16 Enclosed Switches and Circuit Breakers
- 766 Submittal Cover Page
- 766 Table of Contents
- Ladder Cage Drawing A501

## Cross

### Cross Review

- 26 05 19 Low Voltage Electrical Power Conduits and Cables - Cross Review 9-3-13
- 26 05 19 Low Voltage Electrical Power Conduits and Cables
- 26 05 33 Raceway and Boxes for Electrical Systems - Cross Review 9-3-13
- 26 05 33 Raceway and Boxes for Electrical Systems
- 26 27 26 Wiring Devices - Cross Review 9-3-13
- 26 27 26 Wiring Devices
- 26 28 16 Enclosed Switches and Circuit Breakers

## DCI

(Empty)

## Enginuity

### Reviewed

#### 23 09 13 & 23 09 23

- 23 09 13 & 23 09 23
- 230913 230923 Submittal
- Lynnwood Recreation Center - Natatorium HVAC Replacement - Siemens Submittal
- 23 05 19 Meters and Gages for HVAC Piping
- 23 05 23 General-Duty Valves for HVAC Piping
- 23 05 33 Heat Tracing for HVAC Piping
- 23 05 48 Vibration and Seismic Controls for Mechanical Systems
- 23 07 19 HVAC Piping and Equipment Insulation 2
- 23 07 19 HVAC Piping and Equipment Insulation
- 23 09 13 & 23 09 23
- 23 21 13 Hydronic Piping
- 23 21 23 Hydronic Pumps
- 23 31 13 Metal Ducts and Casings R
- 23 31 13 Metal Ducts and Casings
- 23 33 00 Air Duct Accessories
- 23 64 26 Centrifugal or Rotary-Screw Water Chillers

23 81 01 Terminal Heat Transfer Units  
766 Submittal Cover Page  
766 Table of Contents  
Division 230000 Shop Drawings  
System Sensor Smoke Detector

## ORB

### *Previously Reviewed*

06 16 00 Sheathing  
07 54 20 Thermoplastic Membrane Roofing  
08 11 00 Steel Doors and Frames  
08 11 00 Steel Doors and Frames-R  
08 71 00 Finish Hardware  
08 71 00 Finish Hardware-R  
Ladder Cage Drawing A501  
08 11 00 Steel Doors and Frames  
operating procedures - Lynnwood  
Submittal Log  
Submittal Review

## 01 RFIs

### *00 Completed*

#### *RF 11*

RFI 11 Sketch  
RFI 11\_shear wall transfer around parapet\_2013-08-30      Shear Wall Sheeting

#### *RFI 004*

RFI4 Sketch  
RFI4\_2013-08-01      Hold Down at Foundation Concrete Stemwall

#### *RFI 006*

13-006-E400  
RFI6      Electrical 1-Line Diagram for Permit

#### *RFI 007*

RFI7      Interior Duct material Clarification  
RFI7B

#### *RFI 18*

RFI 18 email  
RFI 18      Roof Openings

#### *RFI 22*

RFI 22 email  
RFI 22      Chiller Seismic Holdown

#### *RFI 23*

20131014122153872  
RFI 23 (2)      Chiller layout  
Copy of RFI 20      Door Cylinder Housing  
RFI 1 A      Rooftop Pipe Mounting Detail  
RFI 1 r1      Rooftop Pipe Mounting Detail  
RFI 1      Rooftop Pipe Mounting Detail  
RFI 2 2013-08-01      Chiller Room Wall & Floor  
RFI 3 2013-08-01      G4-Gypsum Shearwall Bottom Plate Attachment to Concrete Metal Deck

RFI 3 r1\_shear wall shot pin substitution\_2013-08-14      G4-Gypsum Shearwall Bottom Plate  
Attachment to Concrete Metal Deck

RFI 5    Fire Protection System for Chiller Room

RFI 7 R1Interior Duct material Clarification

RFI 8 (2)              Delta RFI-2 Exhaust Grilles

RFI 9    Paint Product

RFI 12 08282013              CF-2 Pot Feeder Tie-in

RFI 13    HX-6 and 7 Heat Exchangers

RFI 14 R1 9172013              Temp Power

RFI 14    Temp Power

RFI 15    Unit Heater Piping in Chiller Room

RFI 16    Calcium Silicate Pipe Shields

RFI 17    Wall Panel Design Calculations

RFI 19\_shear wall toe nailing\_2013-10-03              Roof Framing Nailing

RFI 20    Door Cylinder Housing

RFI 21    Insulation under NAH Units

## 01 Original

### RFI 7 R1

RFI 7 R1

RFI 17B

### RFI 8

RFI8

RFI8B

### RFI 13

Existing HX units 001

Existing HX units 002

Existing HX units 003

Existing HX units 004

RFI 13

### RFI 15

RFI 15 Data

RFI 15

### RFI 16

RFI 16 Data

RFI 16

### RFI 18

RFI 18 email

RFI 18

### RFI 22

Chiller Holddown Submittal

RFI 22

### RFI01r1

RFI1 Submittal

RFI1

### RFI3 and RFI03r1

RFI3 Data

RFI3

### RFI7

RFI7

RFI7B

*RFI10*

RFI 10 Sketch

RFI 10

*RFI11*

RFI 10 Sketch

RFI 11

*RFI14*

RFI 14 Panel Schedule

RFI 14

RFI 14B

RFI 12

RFI 20

RFI 21

RFI1

RFI2

RFI4 Sketch

RFI4

RFI5

RFI6

RFI19

operating procedures - Lynnwood

RFI Log

*2011 As-Blt Dwgs*

5-AR-Conformed

7-ME-Conformed

8-FP-Conformed

9-AQ-Conformed

10-EL-Conformed

*2013-04-30 100% Bid Documents*

(Empty)

*2013-06-21 Conformed Set*

*architectural*

Lynnwood Architectural Conformed Set

*electrical*

13-006-E100

13-006-E200

13-006-E201

13-006-E300

*Mechanical and General Sheets*

Mechanical and General Sheets

*structural*

12041-0086-S1-1-D1

12041-0086-S1-2-D1

12041-0086-S2-1-D1

12041-0086-S3-1-D1

*Cad Drawings 08-06-13*

13004 G001  
13004 M001  
13004 M002  
13004 M100  
13004 M200  
13004 M201  
13004 M300.bak  
13004 M300  
13004 M400  
13004 M500  
13004 M600

## *cad mech drawings 8-6-13*

13004 G001.bak  
13004 G001  
13004 M001.bak  
13004 M001  
13004 M002.bak  
13004 M002  
13004 M100.bak  
13004 M100  
13004 M200.bak  
13004 M200  
13004 M201.bak  
13004 M201  
13004 M300.bak  
13004 M300  
13004 M400.bak  
13004 M400  
13004 M500.bak  
13004 M500  
13004 M600.bak  
13004 M600

## *Existing AHU Catalog Data*

111206 AHU O and M

Lynnwood Rec Center Dehumidifier Section - Part 3 of 4  
Operating Procedures - Lynnwood